I. EXECUTIVE SUMMARY

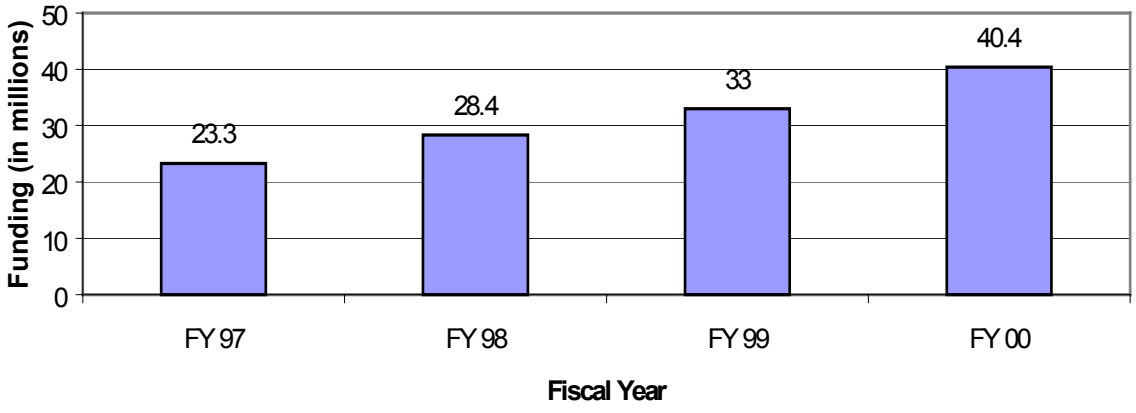
Improving the use of information technology in our educational system has become a national priority. In today's digital world, it is a necessity for students to learn and use technology at an early age. Technology is also transforming how teachers and administrators perform their jobs in public education.

The emphasis on technology is evidenced by the significant amount of money educational organizations have invested. In 1999, there was an estimated $5.4 billion spent in instructional technology and an additional $1.1 billion in administrative technology nationwide.[1]

This focus on technology can also be seen in the State of South Carolina. It is the State's vision to become a national leader in the use of technology in its schools. To accomplish this vision, the State has invested heavily in information technology in recent years.

From 1995 through 1998, the State has invested more than $84 million in hardware, software, and professional development opportunities for schools and districts. State appropriations for educational technology funding have increased from $23.3 million in FY 1997 to $40.4 million in FY 2000.[2]

Exhibit I-1. K-12 School Technology Funding



In addition to investing money in technology, the State has implemented several other initiatives to improve information technology in schools. Examples of these initiatives include:

- Development of an information technology strategic plan

[1] Software and Information Industry Association. *1999 Education Market Report: K-12.* Washington, D.C., 1999.
[2] *South Carolina K-12 School Technology Progress Report for FY 2000.*

- Establishment of a K-12 School Technology Coordinating Committee, composed of state and business members, to identify and address technology needs and issues
- Establishment of 13 Regional Technology Centers to support local school districts' technology needs

These initiatives, along with the State's investment in technology, provide a solid foundation for future technology planning and management. Effective technology planning and management are critical if the State is to accomplish its vision of being a national leader in educational technology.

Ultimately, the State will need to understand how technology investments have contributed to achieving organization-wide goals such as student achievement. This will require effective planning establishing technology goals and strategies that can be linked to organization-wide goals.

After district technology plans have been established, the State must effectively manage technology and update technology plans as necessary. Effective technology management includes:

- Identifying what technology resources are available
- Ensuring that teachers, administrators, and students have the appropriate technology resources and support to perform daily activities
- Understanding how technology resources are being used
- Understanding how the use of technology resources affects performance and goals

There are several challenges to effective technology management for the State and local school districts, including:

- Rapidly changing technology standards
- Large number and various types of schools
- Decentralized nature of schools and school districts

These factors typically prevent state education leaders from having the information necessary to make well-informed technology plans and decisions.

The State has recognized these challenges and has taken action to improve technology management. The K-12 School Technology Coordinating Committee has requested a study to provide a snapshot of current technology resources being used in, or available to, public schools, and to identify the additional resources necessary to make South Carolina a national leader in the use of such technology. The results of the study are intended to assist the State in determining future technology funding allocations. Specifically, the results of this study will assist the State in accomplishing the following objectives:

- Providing a snapshot of current technology resources being used in, or available to, public schools, and identifying the additional resources necessary to make South Carolina a national leader in the use of such technology
- Conducting an inventory of hardware, software, connectivity, training, and staff currently being used
- Determining the gap between the findings of this inventory and the standards for use of technology in public schools
- Providing public schools with the hardware, software, connectivity, staff support, and teacher training necessary to achieve the academic gains that can be realized through the use of technology
- Determining the resources necessary to ensure appropriate public management

In July 2000, the K-12 School Technology Coordinating Committee selected KPMG Consulting LLC to assist in conducting this study. This report contains the results of that study. The remainder of this report is outlined below:

II. Project Objectives and Approach

III. Technology Survey Results

III.1. Hardware and Connectivity

III.2. Audio/video Connectivity

III.3. Technical Support and Maintenance

III.4. Professional Development

III.5. Administrative and Instructional Technology Use

IV. Comparison to Technology Standards

V. Appendices

This study will provide the State with a reliable inventory of the technology resources available to schools and will determine where technology resources are not consistent with technology standards or goals.

Furthermore, this study will provide an overview of technology use by staff. This overview is not intended to be comprehensive, but is a starting point for identifying technology use issues that may warrant State attention or study.

After the state identifies how technology is being used, further analysis can be performed to determine how technology is affecting performance and organization-wide goals.

SUMMARY OF SURVEY RESULTS

The results of the survey provide the State with a general understanding of what technology resources are available to schools and where additional resources are needed to meet minimum standards and goals. Infrastructure areas, such as hardware and connectivity, are in many cases near high tech levels. This is consistent with the State's current phase of technology integration. The four primary phases of technology integration, as defined by the CEO Forum, include:

- Phase I—Planning, investigation, and experimentation
- Phase II—Initial capital outlay
- Phase III—Readjustment
- Phase IV—Emergence of new work and organizational models

Overall, the State as a whole appears to be in the readjustment phase. The State has conducted initial planning and has made initial technology investments to provide schools with hardware, connectivity, training, and support resources. It is now in the process of assessing current technology resources to adjust technology plans and future technology investments.

To improve technology integration in the classroom, the State is now investing in resources such as two-way audio and video, professional development, and home school communication technologies. These technologies significantly affect the State's ability to develop new work and organizational models consistent with Phase IV of technology integration.

As the State moves forward, it will need to maintain and replace existing technology resources while continuing to invest in emerging technology areas. As the State continues to make investments in hardware, network connectivity, and audio and video connectivity, the resources needed to maintain and support these systems and train end users must be balanced to ensure that resources are used in the most efficient and effective manner.

The following section summarizes results for each major survey section. Each section describes:

- Objectives
- Findings generated from survey results
- Recommendations

HARDWARE

Hardware refers to physical devices such as servers, computers, and printers. In recent years, the State has invested considerable money in hardware to provide schools with the basic components for technology use. This section summarizes the following hardware resources:

- Servers
- PCs
- Internet access control

SERVERS

Objective: A server is a piece of hardware similar to a PC that provides access to networks, the Internet, and on-line applications, and also provides the ability to share files and resources. The survey questions were designed to identify the number and types of servers used at the schools. The State has established a goal of two servers per school.

It is also important to understand the types of operating systems schools are using to determine if standards have been developed and followed.

Findings: Based on survey results, there are an average of 2 servers per school, which equals the goal established by the State. Novell was the most common operating system, used in nearly 75 percent of all schools surveyed.

Recommendations: The State is currently meeting the goal of having a minimum of two servers per school; therefore, this is not a high priority area in which to invest additional technology funds. The State should continue to monitor the number and capacity of servers in schools and reinvest in servers when necessary. Servers, similar to PCs, must be upgraded periodically to keep pace with the technical requirements of new applications and networking requirements.

The majority of schools appear to have adopted Novell as the standard operating system for servers. The State should encourage schools to standardize their server operating system to take advantage of volume discounts and to ease the burden of statewide support and maintenance. Standardization can reduce costs by allowing schools to share scarce technical resources and reduce the need to train technical staff to support different platforms.

PERSONAL COMPUTERS (PCS)

Objective: The PC is a critical and basic resource needed to leverage other resources such as networks, software, and peripherals (such as printers). Rapid advancements in technology require schools to continually upgrade the capabilities of computers so that they will perform

at acceptable levels. Upgrades to software and networks require that PCs have increased capabilities to perform effectively.

The survey identified the number of PCs in each of the following categories:

- Above Standard—Processor speed above 500 MHz
- Standard—Processor speed between 200 and 500 MHz
- Below Standard—Processor speed below 200 MHz

These PC standards were measured by location, such as classroom, office, media center, and computer lab.

The survey also captured the information to compute student-to-PC ratios. Student-to-PC ratios provide a basic and important measure of the level of technology capacity in schools.

Findings: The overall student-to-PC ratio was 4.4-to-one, which is below the target range of three to one. However, the 4.4-to-one ratio is categorized as high tech by the CEO Forum and is evidence of the State's progress towards technology readiness.

Approximately one-third of schools' PCs are below standard. Classrooms had the highest rate of below standard PCs, while offices had the lowest number of PCs below standard.

Recommendations: Due to the rapid advancements in PC technology, the State will usually have some PCs that are at or below standard. However, the State should attempt to minimize the number of below standard PCs by continuing to invest in new PCs.

Assuming that a new above standard PC will become a below standard PC after three years, the State and schools should plan to replace every PC after three years. A common approach for spreading the cost of new PCs over several years is to upgrade one-third of all PCs each year.

The State should also concentrate on replacing PCs where the need for high tech computers is greatest. This would typically be in high schools, where there are more advanced applications and network requirements.

Internet Access Control

Objective: Ease of access to Internet information can provide possibilities for abuse and misuse, both by users and by Internet content providers. Schools can try to control Internet access in several ways. Although no method can guarantee access control, schools can reduce the risk by developing policies that document acceptable Internet use and monitoring or preventing access to inappropriate sites.

The survey measured whether schools have developed an acceptable use policy for Internet use, and whether schools used Internet filtering software to control student access to inappropriate Internet sites. Internet filtering software is one of several methods for access control, but this was the only method identified in the survey.

Findings: Of the schools surveyed, approximately 97 percent have developed an acceptable use policy for Internet use.

Based on survey results, approximately two-thirds of schools use some type of Internet filtering software to control Internet access.

Recommendations: The State should continue to encourage schools to develop specific policies describing acceptable use of the Internet and use effective methods to control and monitor access to inappropriate web sites.

CONNECTIVITY

Objectives: Connectivity allows computers and peripheral devices to be networked, enabling computers, servers, and other peripheral devices to share information and resources. Without connectivity, each computer would be an information island, unable to share information or resources.

The survey measured schools' connectivity at two different levels. First, it determined whether schools were connected to a wide area network (WAN). A WAN is a networking of one or more networks in remote buildings. WANs provide schools with the ability to share information between networks and improve access to external information resources, such as the Internet.

The survey also measured school uses of local area networks (LAN). A LAN is a network within a classroom or school that allows computers to share information and resources. The amount of connectivity in schools was measured by the number of classrooms that have networked computers and the number of network drops per classroom. A network drop is the physical connection from a switch or router to a classroom. A classroom with more network drops can provide more computers with network access without decreasing performance (that is, network speed).

Findings: Based on survey results, 100 percent of schools have access to a WAN. This meets the State's goal to connect all schools to a WAN to maximize reliability and performance.

Of the 4,300 permanent classrooms, approximately 82 percent have at least one networked computer. The number of classrooms with five or more networked computers is approximately 10 percent.

Based on survey results, there were an average of 2.4 network drops per classroom, which is half of the State's goal of five per classroom. Nearly 24 percent of classrooms meet the State's goal of five network drops. On the other hand, over 41 percent of classrooms have less than one dedicated network drop. Of the 375 portable classrooms in the schools surveyed, approximately 46 percent are not wired for network access.

Recommendations: The State should continue to commit resources to connect all schools to a WAN. The State should also monitor the amount of bandwidth available to ensure that networks can handle the increasing amount of data being transmitted. Bandwidth is the size of the connection or pipeline through which data flows. The need for more bandwidth is expected to rise as the number of students and teachers using the Internet and e-mail increases and as the number of schools using technologies such as two-way audio and video increases.

The State should also continue to dedicate resources to meet the goals of five networked computers and five network drops per classroom. To fully realize the potential of PCs in the classroom, it is important that PCs be networked to allow students and teachers to share resources and access external information sources, such as the Internet.

Audio and Video Connectivity

Although the PC has become universally associated with the term "technology," many other technologies exist that enhance and supplement the learning process. Distance learning enables distance classrooms and instructors to share information in real-time. TV programs provide timely educational content. Together, these technologies can also improve the level of home-school communication.

Distance Learning/Video Content

Objectives: Distance learning/video content technologies provide schools with additional educational opportunities by providing a method of linking, in real time, students and instructors from different locations. These technologies are usually ready and proven methods for this type of broadcast.

To assess distance learning capabilities, the survey identified schools' two-way audio, one-way video and two-way audio, two-way video capabilities. Two-way audio, one-way video allows two parties to speak to one another, although only one party can be seen on video. Two-way audio, two-way video permits both parties to be seen and heard.

Findings: Based on survey results, there were an average of 1.6 two-way audio, one-way video distance education rooms and 0.34 two-way audio, two-way video distance education classrooms per school. However, these averages are misleading because only 15 of the 119 schools surveyed had two-way audio, one-way video distance education rooms and 13 of the 119 schools had two-way audio, two-way video classrooms. The State's goal is to have at least one two-way audio, two-way video room in every school.

Recommendations: The State should continue to invest in audio and video connectivity resources to enhance and increase students' access to educational opportunities. However, it is important that investments in this be coordinated with other technology investments. Schools should have the necessary infrastructure and hardware before investing in audio and video capabilities.

The number of schools with distance learning capabilities may be increased by educating schools as to what equipment is necessary for two-way audio, one-way video capabilities. A school with a television set, telephone jack, and building distribution system is capable of two-way audio, one-way video. Although the survey did not capture these specific data elements, it is expected that substantially more than 15 of the 119 schools have these capabilities.

TV Reception

Objective: An important technology schools use in instructional delivery is the television. TV allows for reception of educational programs and, when linked to internal building video networks, can be used to broadcast local programs for consumption. When linked to local or national providers, such as cable, TVs provide access to even broader video program resources and enable outreach efforts to local communities.

The survey identified the methods with which schools received TV signals.

Findings: Between 58 and 67 percent of schools receive cable TV, open circuit, and Instructional Television Fixed Service (ITFS). ITFS was received in 77 percent of middle schools, 69 percent of high schools, and 43 percent of elementary schools. Cable TV was received by 69 percent of middle schools, 67 percent of elementary schools, and 62 percent of high schools. Open circuit was received by 73 percent of middle schools, 72 percent of elementary schools, and 43 percent of high schools.

These responses may be lower than the actual numbers as a result of schools not knowing these services are available. For example, 66 percent of schools responded that they receive TV signals via open circuit. However, figures provided by SCETV indicate that approximately 95 percent of schools have open circuit.

Recommendation: The State has strived to reach its targets for TV reception in schools, and should continue to do so. To maximize available resources, the State should promote awareness of these services to ensure that schools are aware of these capabilities.

Home-School Communication

Objectives: Parental involvement is critical to any student's success, and communication with parents is the bridge that improves parental involvement. There are many methods for reaching parents or improving their involvement in their children's schools. It is important for

schools to initiate this communication. Technology makes more opportunities available to begin this dialogue.

Findings: E-mail is the most common type of home-school communication, used by 90 percent of the schools surveyed. Other methods of home-school communication, such as web sites, voice mail and bulletins, and telephone homework hotlines, were less common, being found in less than 50 percent of schools surveyed.

Recommendations: Home-school communication methods can be important tools for promoting the State's goal of increased community and parental involvement. The State should continue to invest resources in these areas to accomplish the goal of having 100 percent of schools use these technologies.

Professional Development

Objective: Professional development is an ongoing investment in teachers and staff. Without professional development, K-12 would most likely stagnate in outdated practices and instructional strategies. The infusion of technology into the classroom necessitates some degree of professional development to ensure that technology is effectively being used and supported.

Findings: The survey found that each respondent group had received some degree of relevant training. Training was also provided at times when most teachers and staff could attend, such as after school. However, the limited availability of stipends may be an obstacle to more staff receiving technology training.

Furthermore, the perception of technology skills self-assessed by teachers tended to be higher than that assessed by media specialists and principals.

Recommendation: The State should more thoroughly assess the state of professional development opportunities for K-12 technology and integration. This includes determining whether the appropriate delivery method for training is being used. The state should also assess the quality and usefulness of the K-12 technology professional development opportunities teachers currently receive. An effort to increase the number of opportunities for professional development may be required to close the gap in perceived skills and improve teachers' technology skills.

Administrative Use—Teachers

Objective: The survey captured and quantified the types of activities teachers performed using technology. This provides the State with some baseline information to determine whether technology resources are being used for the appropriate purposes and whether teachers are aware that these technology options are available.

Findings: The survey found that approximately one teacher in five uses technology for basic student data collection and instructional research. One in three use technology to prepare instructional materials. Principals and media specialists generally observed the same uses by teachers. Uses of technology that leverage technology's potential, such as diagnosing and placing students or analyzing student data, were among the activities that teachers, principals, and medial specialists reported teachers were not conducting with technology.

Recommendation: The State should promote more teacher use of technology by defining technology goals for administrative use of technology by teachers. Although maintaining student data is an important administrative task, the technology allows for more sophisticated functions that can help teachers improve student performance. These functions include diagnosing students and analyzing student data, generating progress reports for students, and researching instructional reference materials on-line. Additionally, the State should provide professional development opportunities that demonstrate the ways in which technology can be used to improve instruction through the previously mentioned functions.

Administrative Use—Administrators

Objective: Survey questions were included to identify what activities administrators perform using technology. This provides the State with some baseline information to determine whether technology resources are being used for the appropriate purposes and whether administrators are aware that these technology options are available.

Findings: As teachers do, administrators use technology in ways that support the instructional environment of schools. Administrators typically have access to more technology and student data than teachers do, and this should translate into providing teachers with more diagnostic information that will improve instruction. Administrators in this survey primarily reported using technology for maintaining student data and communications; however, they reported activities similar to those teachers reported when identifying the activities that are not being conducted using technology.

Recommendation: The State should assess the administrative activities that can contribute most to the instructional process and improve student achievement. These activities should include functions such as analyzing and reporting student performance data for planning purposes, providing on-line instructional resources for teachers and students, using networks to share curriculum materials, and providing this information to parents and the public through the Internet. An assessment should be conducted to determine the readiness of administrators to perform these activities. In addition, an assessment is needed to identify the appropriate software and hardware tools administrators require to perform these activities using technology.

After the appropriate software and hardware tools are identified, leadership at the local level from superintendents, principals, and administrators is necessary to promote the use of these tools for the appropriate activities.

INSTRUCTIONAL USE

Objective: All groups surveyed were asked to determine how technology is being used for instructional purposes. These questions measured classroom readiness and measured whether students are participating in activities that use technology effectively.

Findings: K-12 technology is important because of its expected impact on student learning and performance. Technology is already an important part of today's work environment and technology-fluent workers are needed more than ever. Teachers, principals, and media specialists indicated that students are using technology in a basic manner, such as for remediation for basic skills. Use of technology in higher-order activities, such as understanding complex problems, is not occurring as frequently.

Recommendation: To maximize the learning return on its technology investment, the State should consider creating a strategic map for integrating technology into the instructional process and determining the type of activities it would like to see in the classroom. The State should also develop assessment tools to measure the degree to which planned activities occur in the classroom as well as whether particular technology fluency skills have been learned. This strategic map should consider the grade-appropriate activities. There are several organizations that have provided guidance in these areas, including the International Society for Technology in Education, which recently released its National Technology Education Standards (NETS) for students (1998). This document provides standards for appropriate and effective computer use in schools. Exhibit I-2 summarizes the suggested activities for developing technology literate students.

Exhibit I-2. Technology Literacy Development Activites

School Level	Example of Student Technology Uses	Hardware and Software Requirements	Educational Integration
Elementary	Use input devices (such as mouse and keyboards) and output devices Use technology tools (such as digital cameras, scanners, and web tools) to enhance presentation of materials Use technology resources (such as calculators, videos, and educational TV) for problem solving and self-directed learning Understand developmentally appropriate technology terminology Collaborate with others using technology Create multimedia products with support from teacher Gather information and communicate with others using technology Remediation of basic skills	Multimedia computers with CD-ROMs (standard to above standard PCs) Digital peripherals, such as cameras and scanners TV and access to educational programs Presentation software Creative and developmentally appropriate software Basic word processing software All-in-one project devices Internet access E-mail accounts (minimum teacher or classroom account) Drill and practice software	Preparation of slide shows and multimedia files, reviewing concepts and images related to subject Collaborating with students in other locations on topics of interest to discuss findings Authoring basic essays Self-directed learning

School Level	Example of Student Technology Uses	Hardware and Software Requirements	Educational Integration
Secondary	Understand and solve routine hardware and software problems Understand current changes in information technologies Understand legal and ethical issues related to information technologies Use content-specific tools, software, and simulations to support learning and research Apply productivity/multimedia tools and peripherals to support learning throughout the curriculum Routinely use technology tools and resources for collaboration, research, publication, communication, and productivity Research and evaluate accuracy of information available electronically Understand the effect of technologies on a variety of real-world situations (such as personal, learning, and workplace needs)	Above standard PCs Digital peripherals, such as cameras, scanners, video recorders, and PDAs Content-specific equipment, such as environmental probes, graphic calculators, robotics Productivity software, such as word processing, spreadsheets Multimedia software, such as presentation, web tools Content-specific software, such as scientific or robotics software Content in electronic formats, such as CD and DVD-ROMS, web sites, PDF files Access to TV educational programs Possibly, wireless hardware Internet access and e-mail accounts	Compile research or project information into a multimedia, interactive presentation Use the Internet to research and collaborate on assignments Self-directed learning Use technology to analyze and understand data previously not possible without technology Create original work using technology tools to enhance its presentation, accuracy, and timeliness Collaborate regularly on assignments Utilize simulations and/or content-specific software to understand complex processes Learn technology-related skills, such as web design, computer programming, digital video editing, and hardware and software support

By establishing standards such as these, the State will be better able to assess its impact on student performance.

II. Project Objectives and Approach

The primary objective of this study is to provide a snapshot of current technology resources being used in, or available to, public schools, and to identify the additional resources necessary to make South Carolina a national leader in the use of this technology.

This was accomplished by completing the following major tasks:

- Conducting an inventory of hardware, software, connectivity, training and staff support
- Determining the gap between the inventory and technology standards

The following engagement activities were conducted during the project:

A kick-off meeting was held to introduce KPMG Consulting and K-12 School Technology Coordinating Committee members and confirm study objectives, scope, and approach. Additionally, the statistical relevance of the population sample was confirmed. The relevancy of the population sample is described below.

The survey sample consists of a stratified random sample of 10 percent of all of the public schools in South Carolina. The total sample consists of 119 schools, with at least one from each of South Carolina's 86 school districts. The number of schools sampled per district ranges from one to ten, based on the size of the district. Three to five teachers were randomly selected at each school to complete the teacher portion of the survey.

With a 95 percent degree of confidence and a sample size of 119, the maximum error of the survey is plus or minus 9 percent. That is, the State can be 95 percent confident that the population proportion is within plus or minus 9 percent of the sample proportion. For example, if the survey were to show that 50 percent of the 119 schools have an automated media center, we can be 95 percent confident that between 41 to 59 percent of the 1,180 schools have an automated media center.

After the number of schools was confirmed, the project team developed the survey instrument to collect necessary school information. Survey instruments were developed in cooperation with the K-12 School Technology Coordinating Committee to capture information in the following areas:

- Hardware and connectivity
- Audio/video connectivity
- Professional development
- Technical support and maintenance
- Administrative and instructional uses of technology

Three separate surveys were developed and customized to collect information from principals, teachers, and media specialists/district technology coordinators. The lists below provide a general description of each survey's contents. These lists are not comprehensive, however; copies of the actual surveys are contained in Appendix B of this report.

The principal survey collected information in the following areas:

- General school information such as Basic Education Data System number (BEDS), address, web site, and telephone number
- School characteristics such as type of school, and number of students, classrooms, offices, computer labs, and staff
- Perception of teachers' expertise in selected technology areas
- Perception of what activities students perform using technology
- Perception of what activities teachers and administrators perform using technology

The media specialist survey collected information in the following areas:

- Hardware such as PCs, servers, and printers
- Connectivity of classrooms, offices, computer labs, and media centers
- Number of schools and classrooms with distance learning capabilities
- Types of television reception such as cable, ITFS, and open circuit
- Types of technology used for home-school communication
- Types of technology available beyond the normal school day
- Number of school districts and schools that have technology plans
- What types of resources provide technical support and maintenance
- What resources provide professional development to staff and what technology training staff have received
- Perception of teachers' expertise in selected technology areas
- Perception of what activities students perform using technology
- Perception of what activities teachers and administrators perform using technology

The teacher survey collected information in the following areas:

- What resources provide professional development to staff and what technology training staff have received
- Perception of teachers' expertise in selected technology areas
- Perception of what activities students perform using technology
- Perception of what activities teachers and administrators perform using technology

The surveys were pilot-tested at three schools to validate the survey instrument and site instrument guide, test the data collection procedures and mechanisms, and identify any issues concerning the overall approach and methodology. Based on the pilot-test results, the surveys were revised.

Six field teams composed of KPMG Consulting and State personnel were established and trained to conduct onsite visits of each school. Team leaders from KPMG Consulting's Systems Integration and Public Education practices supervised the field teams.

The six field teams conducted site visits at each school to collect and verify survey responses. During the site visits, the field teams completed the following activities:

- Interviewed each principal or selected school representative and assisted him or her in completing the survey
- Interviewed the media specialist and/or district technology coordinator and assisted him or her in completing the survey
- Interviewed a random sample of three to five teachers and assisted them in completing the survey
- Conducted a walkthrough of classrooms, labs, and media centers to verify survey responses

At the conclusion of the site visits, a total of 119 principals, 557 teachers, 103 media specialists, and 54 district technology coordinators were interviewed.

At the conclusion of each site visit, the field team members input the survey results into a Microsoft Access database. To accommodate the tight project timeframe and large geographic area covered, a web site containing survey forms was created to facilitate the data capture of survey results.

Survey data was further cleansed and verified once data had been input into the database. The Access database was used to analyze the survey data and provide the information necessary to prepare the final report. At the conclusion of the study, the State will be provided a copy of the database for continued analysis and ongoing use.

Status meetings were conducted throughout the project to communicate accomplishments, discuss and resolve issues, and confirm final reporting requirements.

III. Technology Survey Results

The South Carolina school technology survey provides the State with a baseline of data regarding the status of technology in its schools. This information represents a point in time and is based on a sample of schools. Results of the survey will be presented as outlined below:

- Hardware and Connectivity
- Audio/Video Connectivity
- Technical Support and Maintenance
- Professional Development
- Administrative and Instructional Technology Use

Hardware and Connectivity

Hardware refers to such technology devices as servers, computers, printers, and video equipment. Connectivity refers to a school's ability to share information and resources with other users, including specific hardware necessary for networks, intranet, Internet, and cable connections.

Hardware and connectivity are often the first technology investments organizations make. The infrastructure and tools are necessary to realize the benefits possible from technology. Only after hardware is available is there a need for other technology investments such as technical support, software, and training.

In recent years, state and local governments have invested heavily in hardware and connectivity for schools. This section provides specific measures, derived from the survey responses, to determine the level of hardware and connectivity resources available to schools.

Survey Results—Hardware

The survey questions were developed to capture information on the following hardware components:

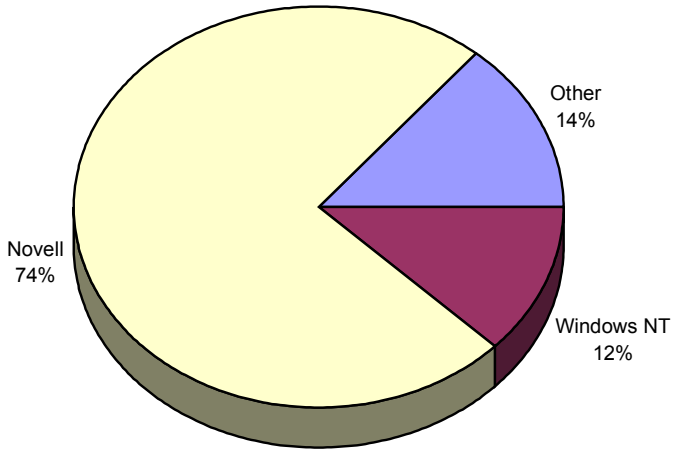
- Network servers
- Personal computers
- Printers
- Other hardware

NETWORK SERVERS

Network servers are used to manage shared resources such as file or printer servers. The functions supported by servers via local area networks (LAN) include file sharing, e-mail, and school-based applications, such as student information.

Exhibit III-1 illustrates the prevalence of network operating systems used at the schools. Novell is the most common operating system, used by 74 percent of schools, followed by Windows NT, which is used by 12 percent of schools. All schools indicated that servers were present in their schools.

Exhibit III-1. Types of Network Servers



PERSONAL COMPUTERS (PCS)

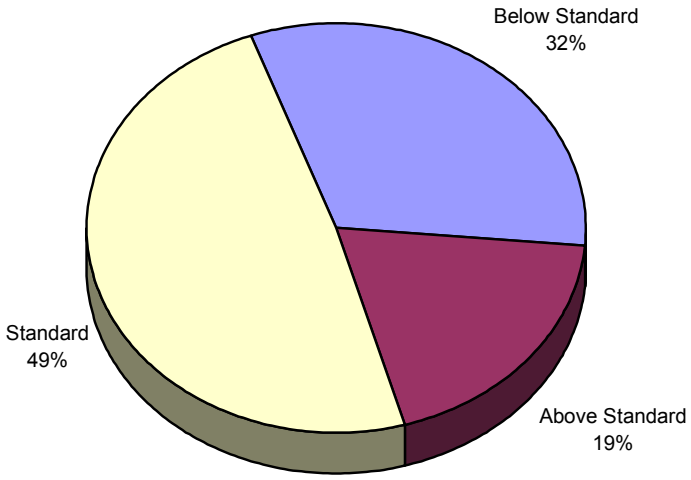
The survey captured information to determine the availability and capacity of personal computers (PC) at the schools. This question was based on the CEO Forum's School Technology and Readiness (STaR) chart framework, which separates PC capacity into one of three categories based on processor speed.

- Above Standard—Processor speed above 500 MHz
- Standard—Processor speed between 200 and 500 MHz
- Below Standard—Processor speed below 200 MHz

Similar measurements were used for Apple computers. The capacity standards were developed by the K-12 School Technology Coordinating Committee. The capacity standards were based primarily on the minimum resources required to use the Internet effectively.

Approximately one-third of PCs in schools surveyed were categorized as below standard. Exhibit III-2 breaks down all PC capacity into above standard, standard, and below standard categories. The survey also captured PC capacity by school location. School location categories include classrooms, offices, computer labs, and media centers.

Exhibit III-2. PCs by Capacity Category



Based on survey results, classrooms had the largest percentage of below standard PCs. Exhibit III-3 breaks down PC capacity by room type.

Exhibit III-3. PC Capacity by Location

	Below Standard	Standard	Above Standard
Classroom	35.6%	46.9%	17.5%
Computer Lab	27.7%	50.9%	21.4%
Media Center	29.7%	51.2%	19.1%
Offices	27.6%	52.1%	20.2%

The survey also collected information on the availability of PCs to students. Exhibit III-4 breaks down student-to-PC ratios by school type (high, middle, and elementary). These ratios include PCs in classrooms, computer labs, and media centers.

Exhibit III-4. Student-to-PC Ratios

Category	Average
Overall	4.4
High	3.8
Middle	4.6
Elementary	4.9

Elementary schools had the highest student-to-computer ratio at 4.9 and high schools had the lowest at 3.8.

Exhibit III-5 breaks down schools by the student-to-PC categories listed in the CEO Forum STaR chart. The STaR chart is organized into the four levels defined in Exhibit III-5, including low, mid, high, and target technology.

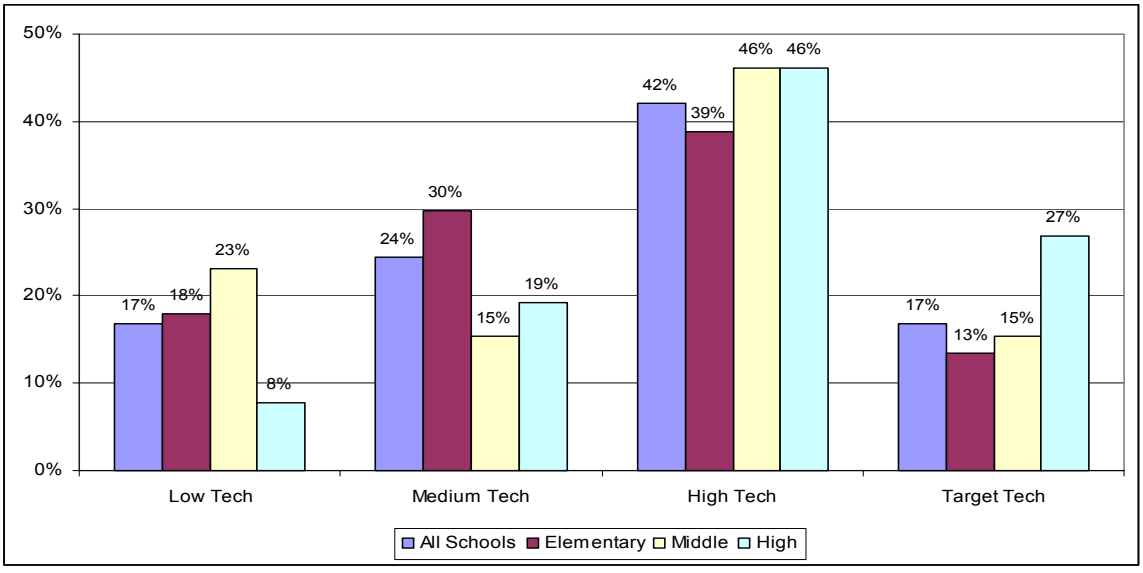
Exhibit III-5. Students per PC

Category	Students per PC	Survey Results
Low Tech	10:1	17%
Mid Tech	7:1	24%
High Tech	5:1	42%
Target Tech	3:1	17%

As Exhibit III-5 shows, approximately 60 percent of schools are in the target tech or high tech ranges for student-to-PC ratios. Exhibit III-6 further analyzes the student-to-PC ratios by school type. High schools clearly had the highest number of schools in the target tech range at 27 percent, while middle and elementary schools were at 15 and 13 percent respectively.

The survey also captured information on the number of laptop computers and mobile computing labs available to students and teachers. An increasing number of schools offer laptops for student checkout and several have plans to offer and expand this service in the future. Of the schools surveyed, approximately 75 percent currently have laptop computers. Ten percent of the participating schools are utilizing mobile laptop labs.

Exhibit III-6. PC Technical Readiness by School Type



To fully realize the potential of PCs in the classroom, it is important that PCs be networked. Being on a network improves the ability to share resources and provides access to a tremendous amount of learning information.

The survey captured information to determine the percentage of classrooms with at least one networked computer and the percentage with at least five networked computers. Of the 4,300 permanent classrooms, approximately 82 percent have at least one networked computer. The number of classrooms with five or more networked computers is approximately 10 percent. Approximately 40 percent of the schools sampled had at least one classroom with five or more networked computers.

Printers

The survey captured information to measure the availability of printers at the schools. Schools were asked to document the number of printers networked as opposed to non-networked, and the number of laser printers versus ink jet printers.

Most printers the participant schools inventoried were not networked. This might be the result of classroom needs to have printouts readily available in the classroom rather than at a different location. Exhibit III-7 shows the ratio of networked to non-networked printers per school.

Exhibit III-7. Printers per School

Printer Type	Survey Results
Networked Ink Jet	1.1
Networked Color	7.9
Networked Laser	4.9
Non Networked	17.8

Exhibit III-8 breaks down printers by school location. Printer categories include ink jet, color, laser, and non-networked. Non-networked includes all printer types.

Exhibit III-8. Printers per School Location

	Ink Jet	Color	Laser	Non-Networked
Classroom	0.8	5.6	2.0	13.5
Office	0.1	0.9	1.3	0.9
Computer Lab	0.1	0.7	0.5	2.4
Media Center	0.1	0.7	1.2	2.4

Other Hardware

The survey also captured information on the use of other technical hardware at the schools. Other hardware examples include color scanners, digital cameras, and graphing calculators. Exhibit III-9 provides the other technology resources by school locations.

Exhibit III-9. Other Technology per School and School Location

	Digital Camera	Scanner	Fax	Calculator
Total	2.1	2.2	1.3	25.5
Classroom	0.6	0.7	0.1	25.0
Computer Lab	0.3	0.5	0.0	0.0
Media Center	1.1	0.7	0.1	1.5

Connectivity

Computers are the primary tool students use to access and create educational content; however, the connection of computers and related hardware to networks holds the greatest educational potential for students. Connectivity provides students, teachers, and schools with access to information available on the Internet.

The survey measured schools' connectivity at two different levels. First, it determined whether schools were connected to a WAN. Based on survey responses, all schools are connected to a WAN, which is consistent with the goals set by the State.

The survey also measured school uses of local area networks (LAN). The following section contains the connectivity results from the surveys.

Classroom Connectivity

The State has established a standard that all classrooms should have at least five PCs connected to the LAN/Internet. A key step toward accomplishing this goal is building infrastructure to meet this capacity, which means wiring classrooms, offices, computer labs, and media centers for connectivity.

Some schools do not have appropriate connectivity because of their buildings' physical limitations. Over 25 percent of schools surveyed had some type of infrastructure limitation that inhibited connectivity. Examples of infrastructure limitations included insufficient electrical capacity and insufficient electrical outlets.

To evaluate classroom connectivity in the schools, the survey measured the number of classrooms wired for intranet/Internet connectivity. Approximately 40 percent of schools and 10 percent of total classrooms had five or more networked PCs. The number of classrooms with at least one networked PC increases dramatically to 96 percent of total classrooms. Of

the 375 portable classrooms in the schools surveyed, approximately 46 percent are not wired for network access.

Another measure of connectivity capacity is the number of network drops per classroom. A network drop is the physical connection from a switch or hub to a classroom. A greater number of direct connections increases the bandwidth to a classroom, thereby improving network performance (speed and reliability). Each school reported slightly over 190 drops per school. On average, the schools have 2.4 network drops per classroom. Exhibit III-10 illustrates the number of connections per classroom.

Exhibit III-10. Network Drops Per Classroom

Number of Drops	Percent of Classrooms
Less than 1 drop	41.2 %
1 to less than 3 drops	24.5%
3 to less than 5 drops	10.8%
5 or more drops	23.5%

Internet Access Control

Due to improved connectivity and increased access to information, it has become important to prevent students from accessing inappropriate material. Schools should develop acceptable use policies to describe appropriate uses of the Internet. In addition, schools should implement an effective method for controlling student access to inappropriate Internet sites.

Based on survey results, 97 percent of schools have an acceptable use policy covering Internet use. The survey also identified the number of schools that use Internet filtering software as a method of access control.

The use of Internet filtering software is one method to block access to particular web sites based on either key words or self-designated ratings from the web site. Approximately two-thirds of the schools surveyed use Internet filtering software. The most popular software schools use is Cyber Patrol, which is used by over 30 percent of the schools surveyed. Exhibit III-11 lists the most common Internet filtering softwares schools use.

Exhibit III-11. Internet Filtering Software

Type	Percent of Schools
Cyber Patrol	30.5%
Border Manager	20.3%
Bess	25.4%
Proxy	10.2%
Other	13.6%

Hardware and Connectivity Conclusion

The State's investments in technology resources can be seen in the amount of hardware and connectivity available to schools. State goals have been accomplished in several basic, but critical, areas such as the number of servers per school and the number of schools connected to a WAN. The State also has an overall high tech rating for the number of PCs in schools. Although the target range has not been met, this shows significant progress.

To improve technology readiness, the State will need to upgrade below standard PCs and increase the connectivity within schools. The State should continue to strive to accomplish the goals of upgrading all PCs to a rating of "standard" or above, and having five networked PCs per classroom and five network drops per classroom.

Audio/Video Connectivity

The use of audio and video information can enhance communication of instructional lessons. The technologies that allow the transmission of audio/video information are important because they provide the ability to reach a larger audience on an existing infrastructure built to support television signals. This has permitted concepts such as distance learning to become growing components of educational institutions. It has also given schools a relatively low-cost way to share expensive educational programming and school information with parents. As the technology becomes digitized, it will be possible to reach even wider audiences as more interactivity becomes possible.

The availability of audio and video connectivity was measured by determining schools' capacities in the following areas:

- Distance learning/video content
- Television reception
- Home-school communication

Home-school communication was included in the survey's audio/video connectivity section as some of the technologies used for TV reception and distance learning are also used to promote home-school communication.

Distance Learning/Video Content

Distance learning has permitted the extension of the learning environment to virtually any location, removing the barrier of location from the educational process. The basic ability to broadcast content using video signals expands the educational resources available to schools.

The evolution of these technologies to include real-time interactivity makes these resources even more effective.

Exhibit III-12 contains the measures used to assess the schools' distance learning and video content capabilities. One of the key distance learning devices measured was two-way audio, one-way video, which allows for interaction with the instructor although the instructor cannot view the classes being taught. The other is two-way audio, two-way video, which allows for video signals to be broadcast and received by both parties. These distance learning devices are becoming more prevalent in schools that want to expand instructional opportunities for students.

Based on survey results, there were an average of 1.6 two-way audio, one-way video distance education rooms per school. There is one two-way audio, two-way video distance education classroom for every three schools. However, these averages are misleading because only 16 of the 119 schools had two-way audio, one-way video distance education rooms and 13 of the 119 schools had two-way audio, two-way video classrooms. Approximately 27 percent of high schools surveyed had at least one two-way audio, one-way video distance education classroom compared to 12 percent for elementary schools and four percent for middle schools. Nearly 35 percent of the high schools surveyed had at least one two-way audio and video distance education classroom compared to six percent of elementary schools and zero percent of middle schools. The State's goal is to have at least one two-way audio, two-way video room in every school.

Other audio and video measures included 3.2 video channels per school, and an average of 0.3 TVs capable of computer projection and 0.4 VCRs per classroom. Eighty-eight percent of schools have internal TV building distribution access, which allows schools to broadcast content on their own channel for viewing within the building.

Exhibit III-12. Distance Learning/Video Content Measures

Measurement	Measure	Standard/Goal
Two-way audio, one-way video distance education rooms per school	1.6 rooms per school	None identified
Percentage of schools with two-way audio, one-way video distance education rooms	13%	None identified
Two-way audio, two-way video distance education rooms per school	1 room for every 3 schools	1 per school
Percentage of schools with two-way audio, two-way video distance education rooms	11%	None identified
Percentage of classrooms with internal TV building distribution access	88%	100%
Percentage of classrooms with distance learning access	7%	None identified

Measurement	Measure	Standard/Goal
Number of internal video channels per school	3.2 channels per school	None identified
TVs capable of computer projection per classroom	0.3 per classroom	None identified
VCRs per classroom	0.4 per classroom	None identified

TV Reception

An important technology schools use in instructional delivery is the television. TV allows for reception of educational programs and, when linked to internal building video networks, can broadcast local programs for consumption. When linked to local or national providers, such as cable, TVs provide access to even broader video program resources and enable outreach efforts to local communities.

Television reception connectivity was measured by identifying the number of schools and classrooms that had various types of cable and satellite reception. It is the State's goal that each school have cable, ITFS, distance learning access, open circuit television, and three SCETV satellite receivers per school.

Exhibit III-13 provides the measures for television reception. Sixty-seven percent of schools have cable TV access, while 56 percent of classrooms have cable TV. Open circuit was the next most common reception type, being present in 66 percent of schools surveyed. Open circuit is regular/local TV channel reception and is not cable-based. It typically uses an antenna for reception. Schools responded that 28 percent of classrooms have Channel One. There was an average of three SCETV satellite receivers per school.

Exhibit III-13. TV Reception Measures

Measurement	Measure	Standard/Goal
Percentage of schools with cable TV access	67%	100%
Percentage of schools with ITFS	58%	100%
Percentage of schools with open circuit	66%	100%
SCETV satellite receivers per school	3 per school	3 per school
Other satellite receivers per school	0.3 per school	None identified
Percentage of classrooms with Channel One access	28%	None identified
Percentage of classrooms with cable TV access	56%	None identified

HOME-SCHOOL COMMUNICATION

One promising use of technology is in building the home-school connection. Home-school communication technologies are mechanisms that allow information to be shared between the school and the community. Examples of current technologies used for home school communication include web pages, homework hotlines, voicemail and bulletins, and local cable access channels. Districts have already begun community outreach through local cable channel access and the broadcasting of educational programs. This outreach will only expand as newer technologies permit e-mail exchanges and allow access to student and classroom information from home.

The State has established a standard that each school should provide all of the home-school communication tools listed in Exhibit III-14. Based on survey responses, the most common type of home school communication available was e-mail, used by 90 percent of schools responding. The remaining home-school communication methods were much less common. Forty-nine percent of schools use a web site for home-school communication, 34 percent use voice mail and voice bulletins, and 17 percent use a telephone homework hotline.

Most schools do not have or use the resources for home-school communication other than e-mail, which is used in 90 percent of schools. Other home-school communication methods, including telephone homework hotlines, voice mail and bulletins, and web sites, were identified in 17 to 49 percent of schools.

Exhibit III-14. Home-School Communication

Measurement	Measure	Standard/ Goal
Percentage of schools that provide telephone homework hotline	17%	100%
Percentage of schools with voice bulletins and voice mail	34%	100%
Percentage of schools with web site used for home-school communication	49%	100%
Percentage of schools with e-mail	90%	100%
Percentage of schools that provide homebound student technology	11%	100%

Distance learning resources were the least common, with only 11 to 13 percent of schools having two-way audio, two-way video and two-way audio, one-way video, respectively.

These findings are consistent with the age, availability, and cost of these resources. Older technology, such as cable TV access, is more common than newer, more expensive technologies such as two-way audio, two-way video.

Audio/Video Connectivity Conclusion

In the areas of audio and video connectivity, the resources associated with television reception were the most common among schools. Schools averaged three SCETV satellite receivers per school, which is equal to the goal the State has set, and between 58 and 67 percent of schools reported having ITFS, open circuit, and cable TV access.

Distance learning capabilities reported appear low, however; one in three schools is aware of having these technologies. Home-school communications could improve, although most of these efforts appear to be centered around Internet-based technology.

Technical Support and Maintenance

Technical support and maintenance are critical to effective technology management. Support and maintenance activities include assisting end users; troubleshooting hardware, software and network problems; and installing and implementing new hardware and software. As the need for technology resources increases, the need for support and maintenance resources increases as well. Technology continues to change rapidly, so schools must provide teachers, students, and staff with the proper technical support to be able to operate technology resources effectively and consistently.

The school survey collected information to determine the resources schools most commonly used for technical support and maintenance, and if these resources were used on a full-time, part-time, or as-needed basis. As illustrated in Exhibit III-16, the majority of schools use technical support and maintenance resources on an as-needed basis. Approximately 86 percent of schools use resources on an as-needed basis, 10 percent as a full-time resource, and 4 percent as a part-time resource.

Exhibit III-15 lists the resources most commonly used on a full-time, part-time, and as-needed basis.

Exhibit III-15

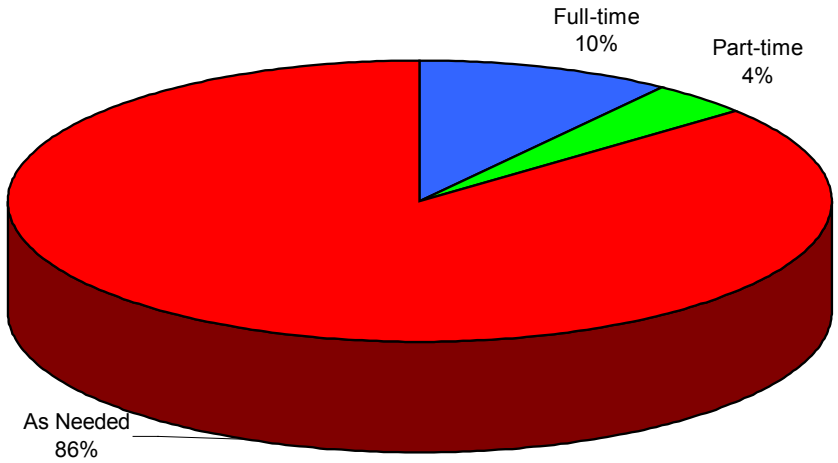
	Resource Type Most Commonly Used	Percentage Used
Full-time	- Librarian/media specialist	28%
	- Central office tech coordinator	25%
	- Central office staff/technician	24%
	- School tech coordinator	14%
Part-time	- School technology coordinator	10%
	- Librarian/media specialist	9%
	- Central office staff/technician	6%
	- Central office tech coordinator	4%

	Resource Type Most Commonly Used	Percentage Used
As needed	- Central office tech coordinator	57%
	- Central office staff/technician	54%
	- Librarian/media specialist	53%
	- Vendor/consultant	50%

The most common resources that schools did not use for technical support and maintenance activities include:

- Parent or community volunteer (84%)
- School-based technician (80%)
- School district help desk (62%)
- State agency personnel (58%)

Exhibit III-16. Technical Support and Maintenance Resources



TECHNOLOGY PLAN

Effective technology management requires proper planning. Developing information technology strategic plans is an effective way to document and communicate technology goals, standards, and priorities. Many states require districts to develop technology plans so that districts will better manage present and future technology resources. Survey results indicate that 98 percent of districts have a technology plan. The State has established a goal that all districts develop a technology plan.

E-Rate Funding

E-rate funding is a discount program sponsored by the Federal Communications Commission that provides discounts on telecommunications and Internet technologies for elementary and secondary schools and public libraries. The E-rate discounts a broad range of Internet and telecommunications services, including basic and high-speed telephone service, Internet access, distance learning and videoconferencing. Survey results indicate that 94 percent of schools have applied for E-rate funding.

Technical Support and Maintenance Conclusion

Schools receive technical and support primarily from central office technology coordinators or staff, or media specialists within the school. These resources most often provide technical and support activities on an as-needed basis.

The vast majority of districts (98 percent) have developed technology strategic plans that document technology goals and standards. The majority of schools (94 percent) have applied for E-rate discounts on various telecommunication and Internet technologies.

Professional Development

Background

Well-trained teachers, administrators, and school staff are the keys to successful classroom technology integration. To ensure maximum return on technology investments, states, districts, and schools must make a commitment to professional development by providing the support, resources, and time required for teachers, administrators, and school staff to learn how to use technology. Any investment in technology at the school level must include professional development opportunities that focus on proper usage, integration, and technical skills to ensure the highest levels of student learning.

In order for the State to assess professional development opportunities in technology, it must determine the extent to which schools are providing professional development activities for their administrative, instructional, and technical staff. This section provides a high level assessment of the State's staff development activities by determining the following:

- Percentage of staff receiving technology training within the last 12 months by staff and training type. This measure summarizes the number of staff that received training by type of training
- Percentage of teachers offered professional development stipends
- Analysis of when professional development activities are available to teachers

- Perceived teacher expertise by staff type. A subjective perspective of principals, teachers, and technology staff (for example, media specialists and district technology coordinators) on the level of technological expertise exhibited by teachers
- Summary of who provides professional development services to schools

Professional development is an ongoing, long-term commitment for all school staff. Teachers must be prepared to face the challenges of technological advances that currently affect the classroom and student learning. Administrators and other school staff must have the proper technological training to effectively run schools. States and districts must ensure that schools have resources to support professional development opportunities for their staff. The following analysis highlights South Carolina schools' commitment to providing professional development opportunities for school-level staff to improve and enhance the technological skills and knowledge necessary in today's public education systems.

Survey Results

A key to successful professional development is providing staff the necessary training opportunities and resources. The increased use of technology in the classroom and for support functions has increased the need to train staff in a variety of technology uses. To determine the extent to which technology training was available to staff, schools were asked to identify the number of staff that received training in the following technology areas:

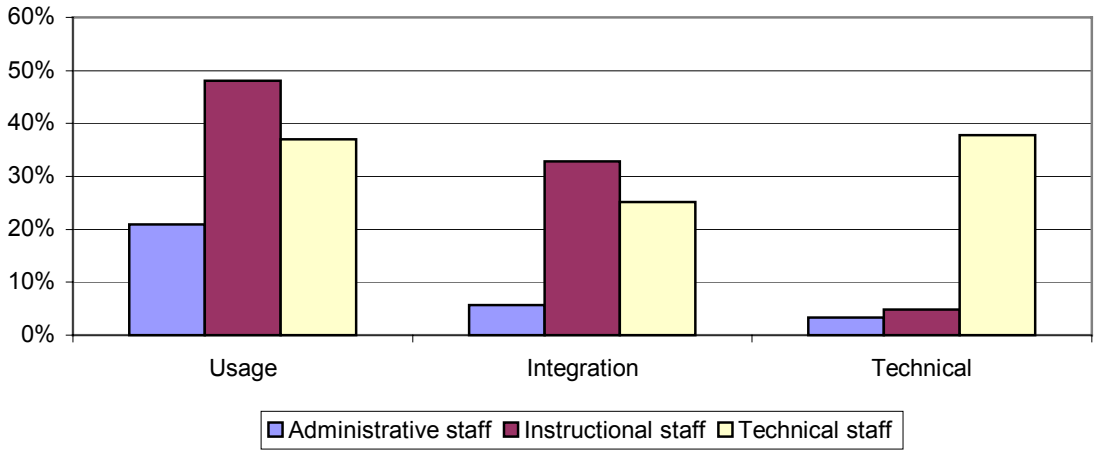
- Usage—how to use software or computer programs
- Integration—how to use technology to improve class instruction
- Technical—training to understand, develop, and support hardware, software, and end users

Based on survey responses, usage training was the most common for each staff type with the exception of technical staff, who received slightly more technical training than usage training. Nearly 50 percent of teachers, 37 percent of technical staff, and 21 percent of administrative staff received some type of usage training. Exhibit III-17 illustrates the percent of staff that received training by each training type.

Approximately 33 percent of teachers, 25 percent of technical staff, and 3 percent of administrative staff received some type of integration training. These results appear consistent with State's current phase of technology development. High usage training is common when staff are learning how to use new software and applications. This is consistent with the State's recent investments in new technology. Integration training usually follows usage training because the staff must know how to use the software before learning how it can assist in classroom instruction.

Technical training was primarily received by technical staff, with 38 percent of technical staff, 5 percent of instructional staff, and 3 percent of administrative staff receiving technical training.

Exhibit III-17. Technology Training by Staff Type



One factor that affects the number of staff trained is the availability of stipends. Stipends are payments to employees who receive training after normal school hours. Training opportunities are often provided during non-school hours, which requires staff to work more hours without compensation. Stipends can provide staff an incentive to attend training and can have a direct effect on meeting training goals. Based on the survey results, 33 percent of teachers had stipends available to them for technology-related staff development activities.

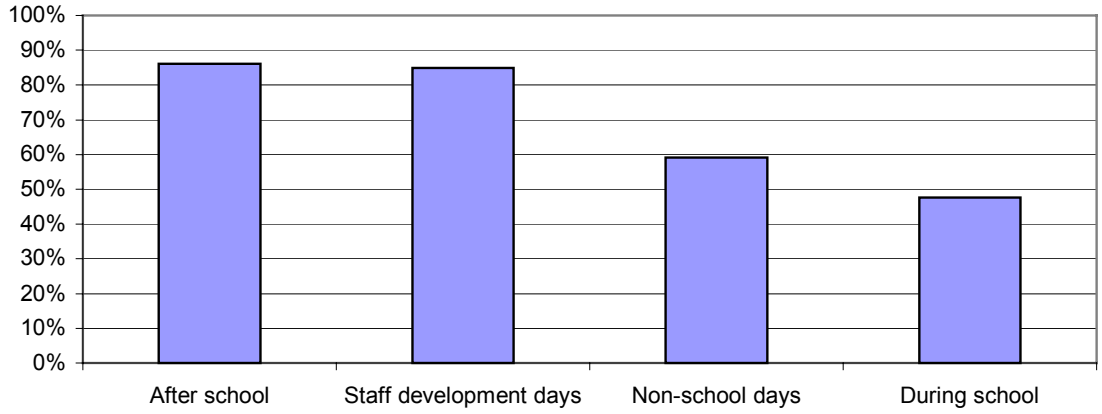
Another factor affecting the number of staff trained is the time of day staff development activities are available. Providing staff development opportunities during school hours or when it is most convenient will often increase the number of staff who receive training. To determine staff development availability, teachers were asked to identify when professional development activities were available given the following choices:

- During school hours
- After school
- Staff development days
- Non-school days (e.g., weekends, summer)

Based on survey responses, after school and staff development days were the most common times staff development training was available. As illustrated in Exhibit III-18, approximately 85 percent of teachers have opportunities for professional development training after school and on staff development days. Approximately 60 percent of teachers have staff development opportunities during non-school days such as weekends and summer break and 48 percent during school hours.

Professional development should have a direct impact on teachers' ability to use technology effectively. Measuring teachers' ability to use technology can indicate whether teachers are receiving the appropriate amount of training.

Exhibit III-18. Staff Development Availability



To quantify teachers' current technology skills, the school survey captured principals', media specialists', and teachers' perceptions of teachers' skills in the following technology areas:

- General computer familiarity
- Internet use
- Technology integration

Each survey respondent was asked to categorize teachers' skills for each technology area into one of the categories below:

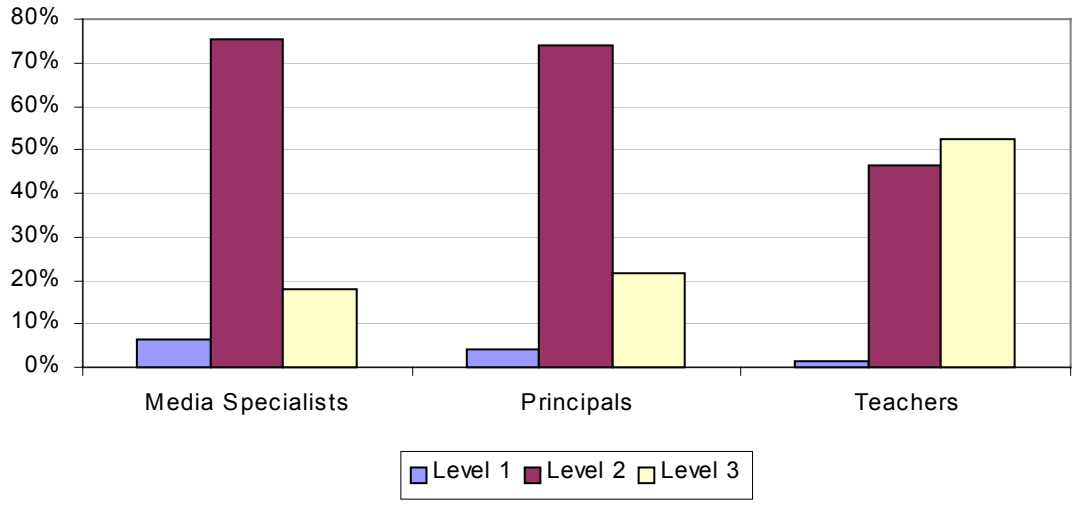
Level 1—Cannot operate computers or access the Internet independently. Not yet comfortable integrating technology into classroom activities

Level 2—Can operate computers, browse Internet, and use e-mail independently. Is currently integrating technology into some classroom activities

Level 3—Can install software and peripherals, and troubleshoot equipment. Can perform a variety of search strategies, and transfer/attach files. Routinely considers the use of technology when planning lessons and experiments with new approaches and technology programs/software for classroom activities

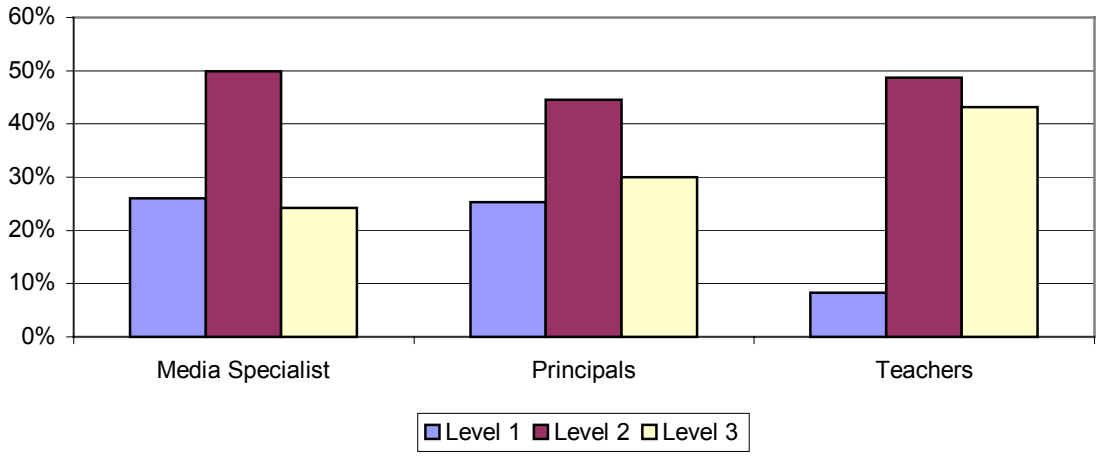
As illustrated in Exhibit III-19, the largest discrepancy in responses in the area of general computing familiarity was between teachers and principals. Over 70 percent of principals and media specialists rated teachers a Level 2, but only 45 percent of teachers rated themselves as a Level 2. In addition, approximately four percent of principals said teachers' general computing was a Level 1 while over 50 percent of teachers said it was a Level 3. Teachers clearly rate themselves more familiar with technology than as perceived by principals.

Exhibit III-19. Teacher Expertise—General Computing Familiarity



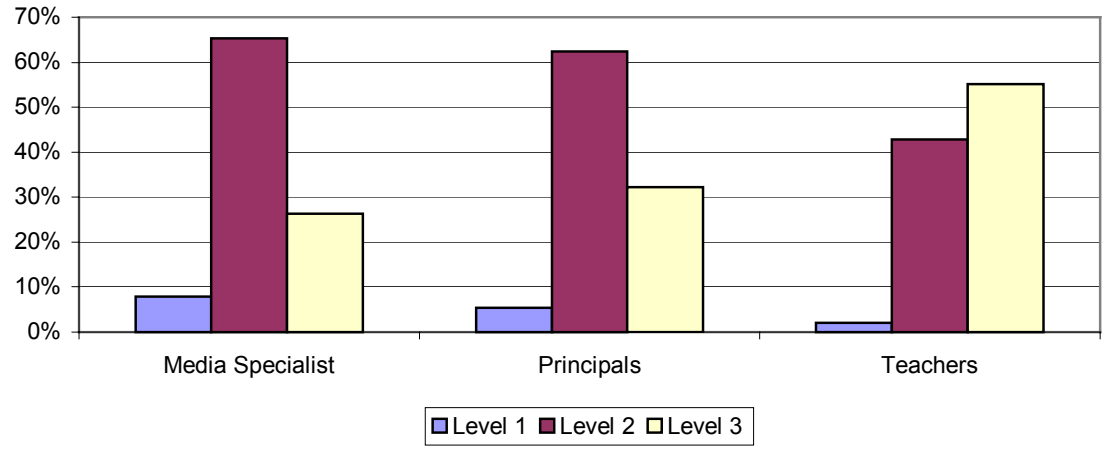
In the area of Internet use, responses were more consistent. As illustrated in Exhibit III-20, over 60 percent of media specialists and principals and over 40 percent of teachers rated teacher skills as a Level 2. However, the majority of teachers, approximately 55 percent, rated teacher skills as a Level 3.

Exhibit III-20. Teacher Expertise—Technology Integration



The perception of teacher expertise for technology integration was relatively consistent across staff types (that is, principal, media specialist, teacher) with 40 to 50 percent of each staff type rating teachers as having Level 2 skills. However, as illustrated in Exhibit III-21, the responses of principals varied considerably, with 25 percent rating teachers' skills as a Level 1, 45 percent as a Level 2, and 30 percent as a Level 3. Media specialists' responses also varied considerably, with 26 percent rating teachers' skills as a Level 1, 50 percent as a Level 2, and 24 percent as a Level 3. These results may indicate a difference in teacher skill levels among different schools.

Exhibit III-21. Teacher Expertise—Internet Use



The survey also collected the data to analyze the resources used to provide professional development services and to determine whether the resources were used on a full-time, part-time, or as-needed basis.

Teachers and media specialists were asked about the following professional development sources:

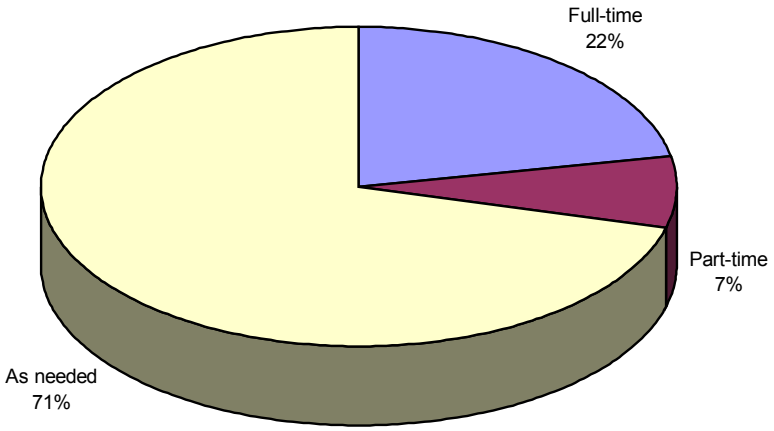
- Technology coordinator within school
- Librarian/media specialist
- Teacher within school
- School-based technician
- Students within school or school system
- Central office technology coordinator
- Central office staff or technicians
- Parent or community volunteer
- Vendor/consultant contract
- School district help desk
- State regional technology specialist
- Other state agency personnel

Based on survey responses, schools primarily used professional development resources from these groups on an as-needed basis. As illustrated in Exhibit III-22, 71 percent of professional development resources were used on an as-needed basis, 22 percent from full-time resources, and 7 percent from part-time resources. The most common resources used on an as-needed basis include the following:

- Library/media specialist

- State regional technology specialist
- Central office technology coordinator
- Central office staff or technician
- Vendor/consultant contract

Exhibit III-22. Professional Development Sources



PROFESSIONAL DEVELOPMENT CONCLUSION

Usage training has been the most common type of technology training administrative, instructional, and technical staff have received. However, many teachers and technical staff have started receiving integration training to better use technology in the classroom. After school and staff development days are the most common times at which professional development activities are available.

Teachers and principals have different perceptions of teachers' general computing familiarity. Over 40 percent of principals believed that teachers had minimal computing skills while over 50 percent of teachers believed that they had advanced computing skills. Overall, principals, media specialists, and teachers rated teachers' expertise in Internet use to be the highest of the technology areas reviewed.

ADMINISTRATIVE AND INSTRUCTIONAL TECHNOLOGY USE

Investment in technology for K-12 is the first of several phases a state must accomplish to become a leader in educational technology. South Carolina has already committed resources and is evaluating how these resources are being used. Due to the significant cost of technology investments, state representatives and the public will want to know how this technology is being used and whether it is improving student performance.

The South Carolina technology survey included a variety of questions designed to capture a glimpse of technology use among different users (teachers, media specialists, and principals). Although these questions were not designed to be comprehensive or to address the link to student performance, they do provide the State with baseline data on both administrative and instructional uses of technology. Findings from these questions should provide additional context that complements hardware and professional development data.

Administrative Use

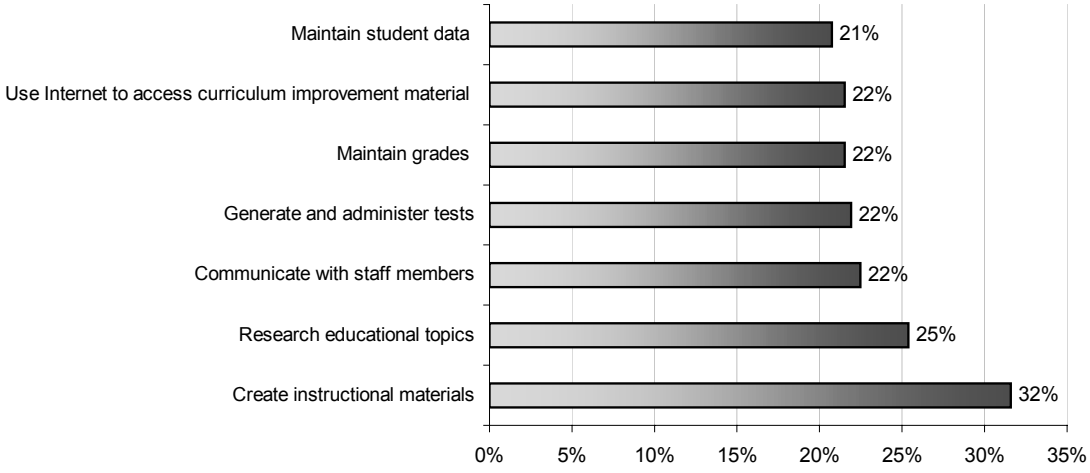
The technology surveys included two sets of questions to capture information on the administrative use of technology. Principals, media specialists, and teachers were asked to comment on the administrative uses of technology by teachers. Principals and media specialists were also asked to comment on the administrative use of technology by administrators. Respondents were asked to estimate the amount of time teachers and administrators spent on a list of administrative and instructional activities, from over two hours a week to not at all. A list of these questions can be found in Appendix A.

Administrative Use of Technology by Teachers

Of the 19 administrative activities listed for teachers, at least 20 percent of teachers reported using technology more than two hours per week to do the following activities (see Exhibit III-23):

- Create instructional materials, visuals and/or presentations
- Research educational topics of interest
- Communicate with staff members and colleagues
- Generate and administer tests
- Use Internet to access curriculum/school improvement material
- Maintain grades
- Maintain student data

Exhibit III-23. Teach Administrative Activities Over 2 Hours/Week (Teacher Respondents)



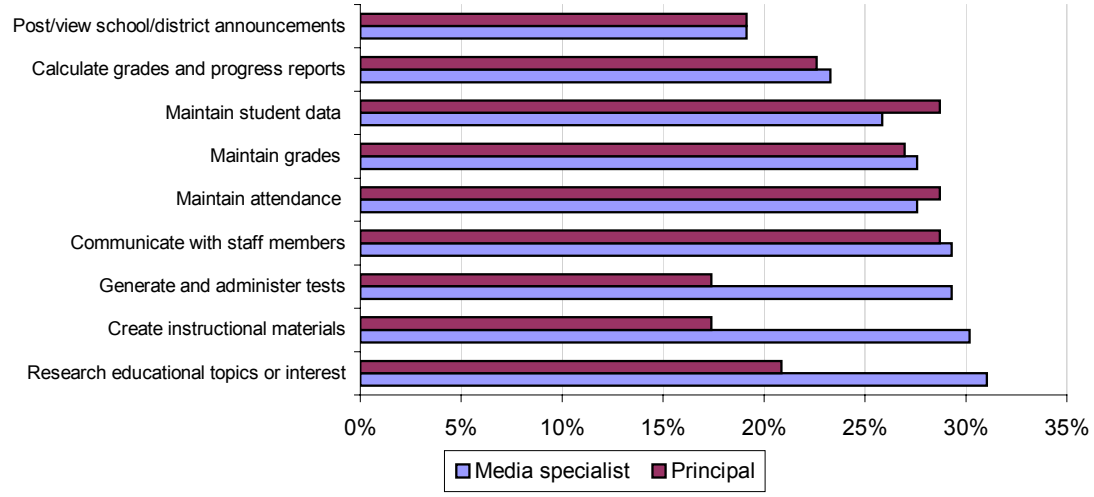
In general, teachers are conducting activities related to classroom materials preparation or student data management.

When the data was analyzed for activities in which teachers ***do not*** use technology, over 50 percent of teachers reported the following:

- Handle inventory
- Maintain attendance
- Use Digital Information for South Carolina Users (DISCUS)
- Participate in on-line discussion groups or collaborative projects
- Diagnose and place students
- Analyze and/or report students/school improvement data

- Principals and media specialists were also asked to identify teachers' administrative use of technology. While the principals reported a slightly higher use of technology than teachers, principals reported a similar list of activities, with the exception of maintaining attendance, calculating grades, and generating progress reports. Media specialists reported a similar set of activities (see Exhibit III-24).

Exhibit III-24. Teacher Administrative Activities Over 2 Hours/Week (Media Specialist/Principal Respondents)



In addition, both principals and media specialists reported similar activities that teachers ***did not*** use technology to perform:

- Handle inventory
- Maintain attendance
- Use DISCUS
- Diagnose and place students

Administrative Use of Technology by Administrators

Principals and media specialists were also surveyed to identify the activities administrators perform using technology. The top activities both groups selected as occurring over two hours per week were essentially identical, with a slight variation in order. At least 30 percent of respondents selected:

- Maintain student data
- Maintain attendance
- Maintain grades
- Communicate with staff members and colleagues

The activities identified reflect administrative functions typically assigned to administrative staff. It is interesting to note that maintaining student related data (such as grades, attendance, and student data) is associated more with administrative staff than with teachers. This may be because computers or necessary software are not yet available for teachers in each classroom.

Principals and media specialists had similar responses when identifying those activities they perceived administrators ***are not*** conducting with technology:

- Generate and administer tests
- Participate in on-line discussion groups or collaborative projects
- Access on-line library media center
- Use DISCUS
- Diagnose and place students

These selections were to be expected because these activities pertain more to instructional than administrative staff.

Instructional Use

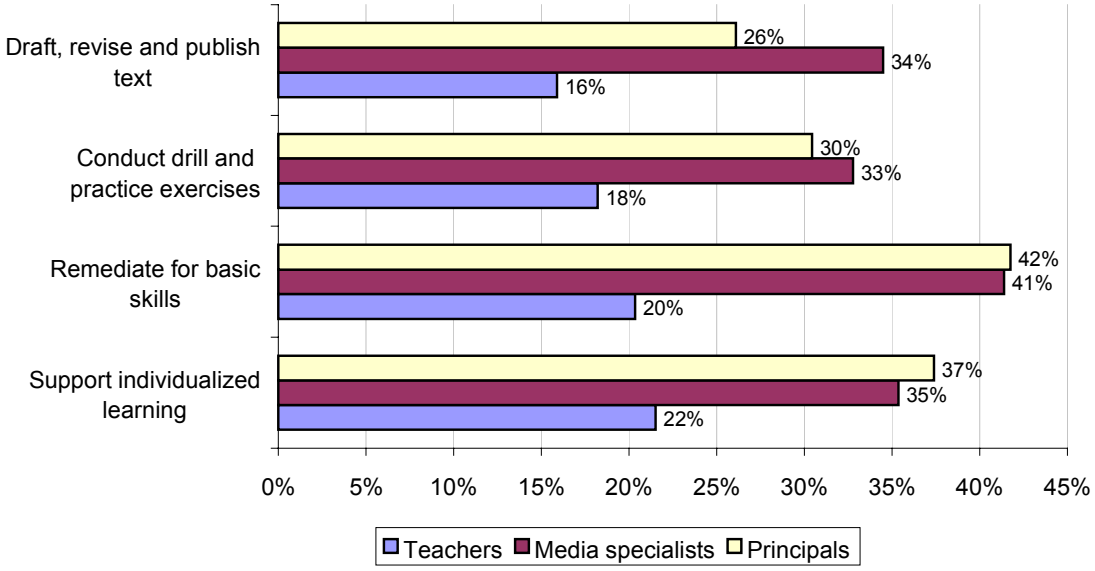
Principals, media specialists, and teachers were asked similar questions on students' uses of technology. These survey questions were included to provide a baseline of information on what schools are doing with the technology available to them.

All three respondent groups reported the same four activities as occurring more than two hours per week:

- Support individualized learning or tutoring
- Remediate for basic skills
- Conduct drill and practice exercises
- Plan, draft, proofread, revise, and publish written text

These activities represent a basic level of technology integration in the classroom. It is important to note that all three groups identified the same four activities as most frequent, because this represents a basic alignment between classroom use and observations (see Exhibit III-25).

Exhibit III-25. Instructional Use of Technology Over 2 Hours/Week (All Respondents Groups)



For activities ***not being*** performed at all, all three respondent groups once again chose a similar list of activities:

- Control other devices (robotics)
- Design and produce a product (computer-aided manufacturing)
- Generate original pieces of visual art and/or musical compositions
- Produce local video shows
- Develop understanding of complex materials or abstract concepts (e.g., through visual models, animations, simulations)

These activities are clearly more related to higher-order computer instruction and require more technology resources, which may be an indication of the current level of technology investment in schools.

Technology Resources Beyond Normal School Day

More and more, schools are providing students and community members with technology resources beyond the normal school day as the technology needs of school and community members increase. To determine what technology resources are available for students and the community to use beyond normal school hours, schools were asked which of the following are available:

- Computer lab
- Library/media center
- Classrooms

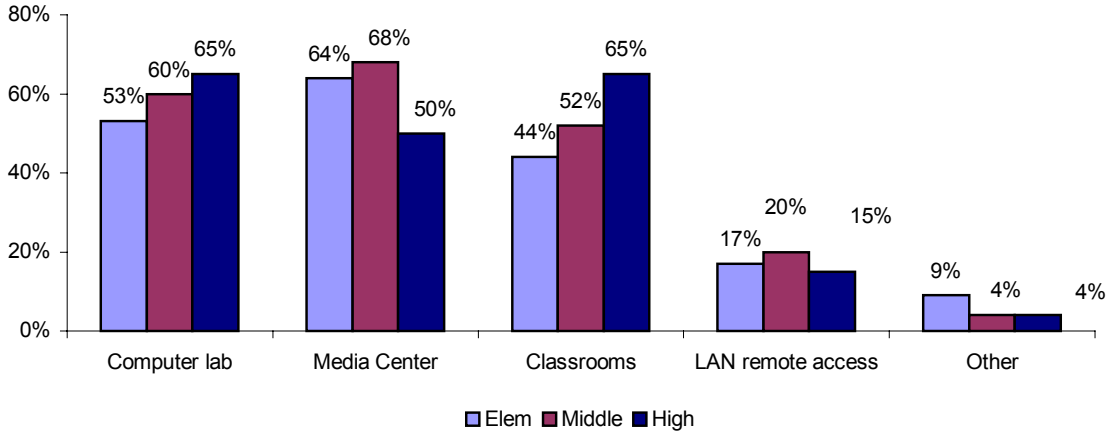
- Remote access to school LAN resources

Sixty-two percent of the respondents stated that the library/media center was used after the normal school day, while remote access to school LAN resources is available to only 17 percent of the respondents. Classrooms and computer labs are other technology resources available beyond the normal school day for half or more respondents, 50 percent and 57 percent, respectively. Based on survey responses, it appears that schools are making an effort to provide technology resources to students and community members outside of regular school hours.

When viewing the survey results by school type, most elementary, middle, and high schools offer computer labs and libraries/media centers for student and community use beyond the normal school day. Exhibit III-26 breaks these out by school level. LAN remote access is not regularly available for students and community members: 17 percent of elementary schools, 20 percent of middle schools, and 15 percent of high schools responded that they have access to this resource.

Overall, survey results illustrate that computer labs, media centers, and classrooms are the primary technology resources available to students and the community beyond the normal school day.

Exhibit III-26. Technology Resources Available by School Type



ADMINISTRATIVE AND INSTRUCTIONAL TECHNOLOGY USE CONCLUSION

The use of technology in South Carolina's K-12 system is encouraging. Based on survey responses, teachers are beginning to integrate technology into instructional activities, primarily through classroom preparation and management activities. In terms of administrative activities, teachers appear to be focused on classroom preparation and less on student data management, which is currently being done by administrative staff.

IV. Comparison to Technology Standards

The data collected in the South Carolina Technology survey will provide the K-12 School Technology Coordinating Committee with information that identifies where South Carolina is meeting its K-12 technology goals and where additional resources may be warranted. This section contains a gap analysis that compares the current technology levels of schools with standards or goals established by the State or through education technology sources. Standards were developed from the following sources:

- South Carolina Education Technology Plan: Published in 1995 and updated in 1999, this plan provides the vision and standards for use of and access to technology in South Carolina's public schools
- CEO Forum – STaR Report: The CEO Forum helps to ensure that America's schools effectively prepare all students to be contributing citizens and productive workers in the 21st Century; the forum issues an annual assessment of the nation's progress toward integrating technology into American classrooms
- SC K-12 School Technology Coordinating Committee: Composed of state and business members to identify and address technology needs and issues

Where clear standards were available, tables were developed to summarize each measure, the corresponding survey results, and the "gap" or deficiency in current technology resources. In addition, other survey elements designed to capture information on resources available to schools have been included in this section to further describe barriers that may exist to the effective use of technology in the State of South Carolina.

Sections covered in this chapter include:

- Hardware and Connectivity
- Audio/Video Connectivity
- Assistive Technology
- Administrative and Instructional Technology Use
- Adequate Technology Resources for Student Use (open-ended question)
- Open-Ended Responses

Summary

South Carolina has made tremendous investments in K-12 technology in the last 4 years alone, and this investment has been felt in the classroom. South Carolina has made significant progress. The Governor and State Superintendent, however, have set the goal of being a national leader in K-12 technology. In this context, South Carolina has many goals to reach.

Exhibit IV-1 summarizes the comparison of various data elements to technology standards. As the graphic shows, South Carolina is below standards or goals in many of the areas surveyed.

In terms of some basic technology inventory such as servers per school, South Carolina schools are above standard. On hardware questions such as distance learning equipment, the gap between existing inventory and the goals is below standard. This gap undermines the instructional benefits of such technology, as shown in Exhibit IV-1.

In terms of whether adequate technology resources are available, survey responses were split across survey groups. Teachers felt adequate resources were available while media specialists and principals were less likely to agree with this statement. When asked what resources were needed, respondents indicated more computers in the classrooms, more technical support and training, and more training time.

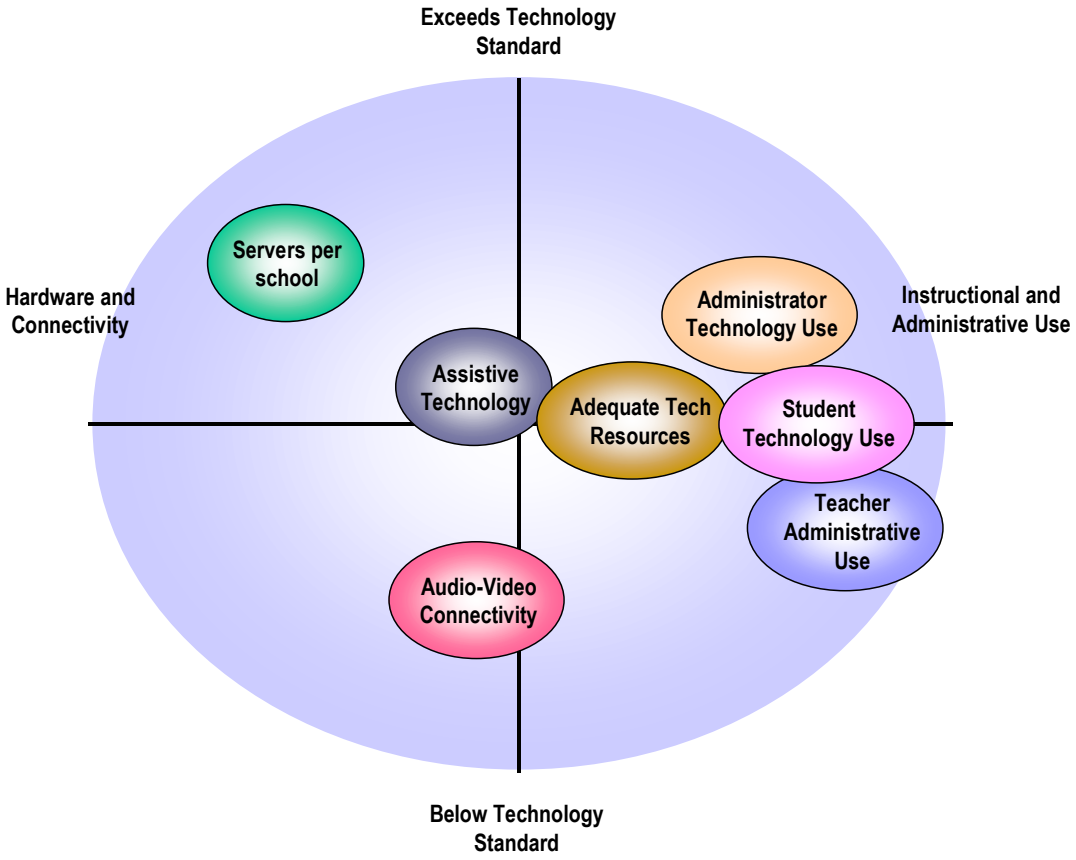
Questions about assistive technology and its use elicited positive responses concerning its use and knowledge of its existence. All respondent groups, especially principals and media specialists, responded that assistive technology was used for students when needed. Approximately 10 percent or less responded that they were aware of the technology but not trained in it, or that it was not available.

Student use of technology reflected low to mid technology readiness as defined by the CEO Forum. This does not indicate that technology is not being used in the classroom. It does suggest activities that are defined as indicating low to mid technology integration and use. Perhaps this is due to recent investment in technology, and the likely early phases of technology integration by teachers.

Using the same CEO model, the survey asked questions about teachers' administrative use of technology and administrators' use of technology. Teachers reflected low technology use and integration, while responses on administrators indicated some low and high technology use.

It is important to note that this survey only represents a quick snapshot of technology inventory and use; however, it does provide a starting point for discussion and policy recommendations. Each section of standards is discussed in more detail.

Exhibit IV-1. Gap Analysis Summary



HARDWARE AND CONNECTIVITY

PERSONAL COMPUTER INVENTORY

The number of servers indicated in the technology survey was compared with the South Carolina Educational Technology Plan standards. Exhibit IV-2 illustrates that schools have more servers than the State standard in each category. A server provides the operating systems used to run major applications throughout the school. Having more than one server allows for greater access and speed for running applications. Server operating systems include Novell NetWare, Windows NT, and UNIX.

Exhibit IV-2

Measurement	Survey Results	Standard	Gap
Servers per school	2	1 per school	100% above standard
Servers per HS	3	1 per HS	200% above standard
Servers per MS	1.6	1 per MS	60% above standard
Servers per ES	1.9	1 per ES	90% above standard

Source: SC Educational Technology Plan

Personal Computer Capacity

Another measurement conducted to compare with national standards is the capacity of PCs at the schools. The PCs were placed into one of three categories based on computer processor speed. All PCs with processor speed above 500 MHZ were categorized as "Above Standard," those between 200 MHz and 500 MHz were categorized as "Standard," and those PCs with speed below 200 MHz were categorized as "Below Standard." Similar measurements were used for Apple computers inventoried.

As illustrated in Exhibit IV-3, approximately one third of the schools' computers are below standard. The State should focus on increasing the capacity of PCs at the schools to enhance the efficiency of computer use for teachers, students, and school staff. Survey responses from principals, teachers, and media specialists reflect the need to upgrade the capacity of computers in the schools. This was one of the major comments made by respondents in the survey.

Exhibit IV-3

Measurement	Survey Results	Standard
Percent below standard	32%	IBM: Under 200 MHz Apple: Non-Power PC
Percent at standard	49%	IBM: 200-500 MHz Apple: Power PC below 300 MHz
Percent above standard	19%	IBM: Above 500 MHz Apple: Power PC equal to and above 300 MHz

Source: SC IRC Standards

Personal Computer Availability

KPMG Consulting evaluated the availability of PCs in the classroom. Exhibit IV-4 illustrates the CEO Forum's students-per-PC standards. The chart is organized into the four levels

provided by the CEO Forum, including low, mid, high, and target technology. This measurement includes student computer use only and student/teacher computer use.

According to Exhibit IV-4, 44 percent of the schools have five students per PC. However, 76.9 percent of the schools fall below the target technology standard of three students per PC. It is critical for students and teacher to have access to PCs to use technology to enhance learning and teaching in the classroom.

Exhibit IV-4

Measurement	Survey Results	Standard
Low Technology	17%	10:1
Mid Technology	24%	7:1
High Technology	42%	5:1
Target Technology	17%	3:1

Source: CEO Forum STaR Report

CLASSROOM CONNECTIVITY

The State expects all classrooms to be connected to the Local Area Network (LAN)/Internet and Wide Area Network (WAN). The LAN enables schools to access a web browser, such as Netscape Navigator or Microsoft Internet Explorer, and surf the Internet on a PC. A LAN is a computer network that spans a relatively small area. LANs are confined to a single building or group of buildings. The WAN is a computer network that spans a relatively large geographical area.

Exhibit IV-5 compares the schools to the connectivity standards. All of the schools surveyed are connected to a WAN, which is consistent with the State's goal that all schools be connected to a WAN and the State backbone and network. Similarly, 95 percent of the schools are connected to the LAN/Internet, a 5 percent gap from the State's goal of 100 percent.

On average, schools have 2.2 network drops per classroom, which is 56 percent below the standard of five network drops per classroom. Network drops provide network connections to computers, so the fewer network drops a classroom has, the greater the limitations are on computers being connected to the network. The State should increase the number of network drops in the classrooms to increase the capacity of network connections in the classroom.

Exhibit IV-5

Measurement	Survey Results	Standard	Gap
Percent of schools connected to a WAN	100%	100%	At Standard
Percent of schools with LAN/Internet access	95%	100%	5% below standard
Network drops per classroom	2.4 per classroom	5 per classroom	52% below standard
Percent of classrooms with at least 1 networked PC	88%	100%	12% below standard
Percent of classrooms with 5 networked PCs	10%	100%	90% below standard

The State expects 100 percent of classrooms to have at least one networked PC. According to survey results, only 88 percent of schools have at least one networked PC per classroom, creating a gap between State expectations and current status of 12 percent. Furthermore, a greater gap exists for the percentage of classrooms with five networked computers: ten percent of the schools have five networked computers in the classroom, a gap of 90 percent from what the State expects.

Survey results indicate the State needs to focus efforts on providing classrooms with the necessary software and hardware connections to meet its connectivity goals. Individual survey responses from teachers, principals, and media specialists reflect this need for more networked computers in the classroom.

Audio/Video Connectivity

Exhibit IV-6 provides the gap analysis for audio/video connectivity resources. The table is sorted in descending order, placing the resources with the largest deficiencies on top. For example, the State has set a goal that all schools should provide a telephone homework hotline for homebound student use. Based on the survey, only 17 percent of schools have this capability, meaning there is a gap of 83 percent.

Exhibit IV-6. Audio/Video Connectivity Gap Analysis

Measurement	Survey Results	Standard/Goal	Gap
TV capable of computer projection per classroom	0.3 per classroom	1 per classroom	0.7 per classroom
Two-way audio and video distance education rooms per school	0.34 rooms per school	1 per school	0.66 rooms per school
Percentage of schools that provide homebound student technology	11%	100%	89%

Measurement	Survey Results	Standard/Goal	Gap
Percentage of schools that provide telephone homework hotline	17%	100%	83%
Percentage of schools with voice bulletins and voice mail	34%	100%	66%
Percentage of schools with web site used for home-school communication	49%	100%	51%
Percentage of schools with ITFS	58%	100%	42%
Percentage of schools with open circuit	66%	100%	34%
Percentage of schools with cable TV access	67%	100%	33%
Percentage of schools with e-mail	90%	100%	10%
SCETV satellite receivers per school	3	3	0

Survey results also indicate that the State has reached its goal of having an average of three SCETV satellite receivers in each school.

Assistive Technology

Assistive technology is used to assist students with disabilities or learning difficulties. Examples of assistive technology include:

- Portable word processors
- Braillers
- Electronic communication aids for speech

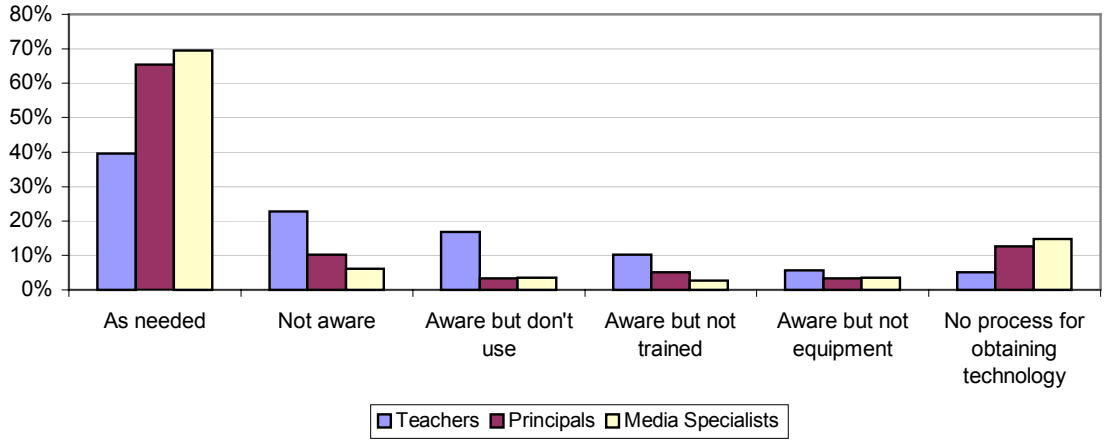
To determine the prevalence of assistive technology, teachers were asked to select the choice that best represents their use of assistive technology:

- I am aware of these options, but do not use with students
- I am not aware of these options
- I am aware of these options, but haven't been trained to use with students
- I am aware of these options, but there is no equipment available
- There is no clear process in place in our school for obtaining assistive technology

In addition, teachers, principals, and media specialists were asked for their perceptions of teachers' use of assistive technology. Exhibit IV-7 summarizes responses to this question. The most common response for all three staff types was "as needed," with 70 percent of media specialists, 66 percent of principals, and 23 percent of teachers having this response. There is however, a 20 to 30 percent difference between teachers' responses and those of

principals and media specialists. The second most common response for teachers was that they are "not aware" of assistive technology.

Exhibit IV-7. Assistive Technology



Administrative and Instructional Technology Use

The South Carolina K-12 Technology Survey contained various questions that asked teachers, media specialists, and principals about student and teacher use of technology. In addition, the media specialist and principal surveys contained additional questions on administrators' use of technology.

These responses were compared to standards using the CEO Forum STaR chart. The STaR chart contained basic definitions for low, mid, high, and target technology integration and use definitions. Using this chart, survey questions were coded to allow for comparison with the STaR chart and to describe the current state of technology use in South Carolina's education system. A complete table of the responses can be found in Appendix A.

Administrative Use of Technology

Exhibit IV-8 summarizes the responses of teachers to questions on administrative technology use. As is shown in the data, teachers spend over two hours per week on activities defined as low to mid technology use. More than 23 percent of respondents did not report activities defined as high technology use over two hours per week, whereas as many as 32 percent of teachers reported low technology use activities.

Exhibit IV-8. Teacher Administrative Use of Technology

Tech Use Level	Survey Question	Over 2 hrs/wk
Low	6.13 Create instructional materials, visuals and/or presentations	31.7%
Low	6.08 Maintain grades	21.8%
Low	6.11 Maintain student data	20.8%
Low	6.07 Maintain attendance	11.1%
Low	6.06 Diagnose and place students	10.5%
Mid	6.16 Research educational topics or interest	25.6%
Mid	6.09 Generate and administer tests	22.1%
Mid	6.10 Calculate grades and generate progress reports	20.1%
Mid	6.17 Handle inventory	7.5%
Mid	6.15 Use DISCUS	6.9%
High	6.01 Communicate with staff members and colleagues	22.9%
High	6.14 Use Internet to access curriculum/school improvement material	21.8%
High	6.03 Post/view/access school/district announcements or information	17.4%
High	6.05 Utilize the Internet to electronically share information (lesson plans, common interests)	17.2%
High	6.12 Analyze and/or report students/school improvement data	12.0%
High	6.18 Access on-line library media center	11.5%
High	6.02 Communicate with parents/guardians of students	11.3%
High	6.04 Participate in on-line discussion groups or collaborative projects	8.0%
High	6.19 Access on-line teacher certification forms, information	7.8%

Although media specialists responded similarly, principals responded that teachers were performing more high-tech use activities more than two hours per week; however, the pattern of responses was very similar, with low to mid administrative activities performed by teachers receiving substantial responses.

Student Use of Technology

Students' use of technology was reported as primarily low but there were substantial responses in the mid-level category. Principals and media specialists tended to report a higher frequency of activities occurring over two hours per week. Exhibit IV-9 summarizes this data.

It appears that teachers are conducting activities indicative of early technology adoption. These activities include remediation of basic skills, drill and practice, and preparation of instructional materials on computers.

Administrator Use of Technology

Administrator use of technology, as reported by media specialists and principals, fell along both ends of the spectrum. Although a majority of respondents selected the low-tech level of use activities for administrators, a substantial percentage also answered for high-tech use activities. Exhibit IV-10 summarizes this data.

Exhibit IV-9. Student Use of Technology

Tech Use Level	Activity reported over 2 hours / week	Teachers	Media Specialists	Principals
Low	5.18 Remediate for basic skills	20.2%	40.9%	42.5%
Low	5.21 Conduct drill and practice exercises	18.3%	32.2%	31.7%
Low	5.08 Plan, draft, proofread, revise and publish written text	16.2%	33.9%	25.0%
Low	5.02 Organize and store information	15.1%	22.6%	15.8%
Low	5.09 Create graphics or visuals (e.g., diagrams, pictures, figures)	9.4%	16.5%	9.2%
Low	5.14 Connect auditory language to the written word and/or graphic representations (for the emerging reader)	8.8%	15.7%	13.3%
Mid	5.12 Perform calculations	12.2%	28.7%	20.0%
Mid	5.01 Gather information from a variety of sources (e.g., Internet, CD-ROMs)	11.7%	12.2%	20.8%
Mid	5.06 Display data/information (e.g., charts, graphs, maps)	9.8%	20.0%	10.0%
Mid	5.22 Utilize Internet standardized test preparation materials	6.3%	16.5%	10.0%
Mid	5.10 Plan, refine, and produce audio/visual presentations	5.4%	18.3%	6.7%
High	5.17 Support individualized learning or tutoring	21.6%	34.8%	38.3%

Tech Use Level	Activity reported over 2 hours / week	Teachers	Media Specialists	Principals
High	5.19 Accommodate for a disability or limitation	10.9%	20.0%	16.7%
High	5.03 Perform measurements and collect data in investigations or lab experiments	6.1%	8.7%	10.0%
High	5.13 Develop understanding of complex materials or abstract concepts (e.g., through visual models, animations, simulations)	5.7%	9.6%	5.8%
High	5.07 Demonstrate classroom interactive sessions on the Internet (e.g., use of email, bulletin boards, home pages)	5.2%	7.8%	7.5%
High	5.20 Produce local video shows	5.2%	20.0%	14.2%
High	5.15 Design and produce a product (computer-aided manufacturing)	5.2%	9.6%	3.3%
High	5.11 Generate original pieces of visual art and/or musical composition	3.4%	9.6%	3.3%
High	5.16 Control other devices (robotics)	2.3%	6.1%	1.7%
Target	5.05 Communicate/report information, conclusions or results of investigations	9.7%	12.2%	12.5%
Target	5.04 Manipulate / analyze / interpret information or data to discover relationships, generate questions, and/or reach conclusions	9.2%	12.2%	9.2%

Exhibit IV-10. Administrator Use of Technology

Tech Use Level	Activity reported over 2 hours / week	Media Specialists	Principals
Low	19.06 Diagnose and place students	21.7%	10.8%
Low	19.07 Maintain attendance	60.0%	62.5%
Low	19.08 Maintain grades	41.7%	32.5%
Low	19.11 Maintain student data	64.3%	60.8%
Low	19.13 Create instructional materials, visuals and/or presentations	16.5%	13.3%
Mid	19.09 Generate and administer tests	11.3%	7.5%
Mid	19.10 Calculate grades and generate progress reports	29.6%	22.5%
Mid	19.15 Use DISCUS	10.4%	5.8%

Tech Use Level	Activity reported over 2 hours / week	Media Specialists	Principals
Mid	19.16 Research educational topics or interest	22.6%	19.2%
Mid	19.17 Handle inventory	18.3%	18.3%
High	19.01 Communicate with staff members and colleagues	34.8%	39.2%
High	19.02 Communicate with parents/guardians of students	16.5%	13.3%
High	19.03 Post/view/access school/district announcements or information	20.9%	25.0%
High	19.04 Participate in on-line discussion groups or collaborative projects	7.8%	6.7%
High	19.05 Utilize the Internet to electronically share information (lesson plans, common interests)	11.3%	13.3%
High	19.12 Analyze and/or report students/school improvement data	29.6%	23.3%
High	19.14 Use Internet to access curriculum/school improvement material	23.5%	21.7%
High	19.18 Access on-line library media center	9.6%	8.3%
Low	19.06 Diagnose and place students	21.7%	10.8%

ADEQUATE TECHNOLOGY RESOURCES FOR STUDENT USE

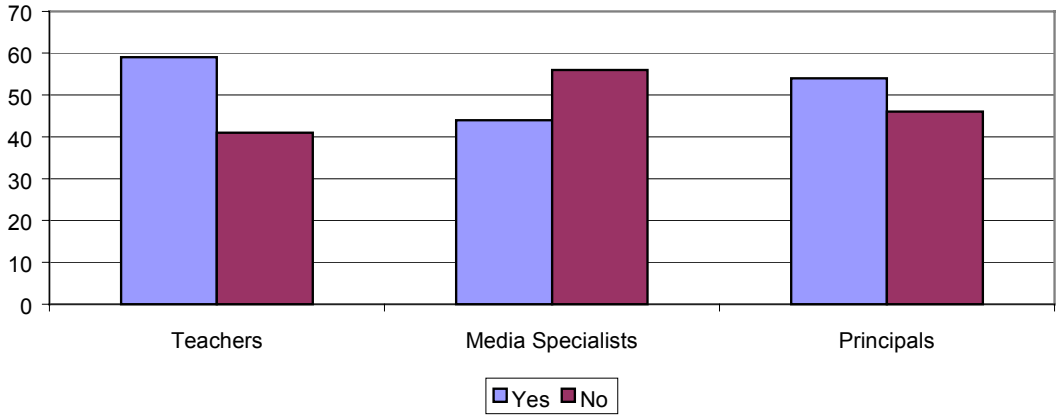
To assess the adequacy of technology resources for student use, teachers, media specialists, and principals were asked whether sufficient technology resources are available for student use. Although it is a subjective measure, this question communicates the perceptions of teachers, media specialists, and principals.

Overall, 44 percent of the respondents believed the resources available were adequate, while 56 percent did not think the resources available were adequate.

Exhibit IV-11 shows the responses to this question by staff type (principal, media specialist, teacher).

As illustrated in Exhibit IV-11, the majority of principals and teachers, 54 percent and 59 percent respectively, believe current technology resources are adequate. In contrast, only 43 percent of media specialists believe that available technology resources are adequate.

Exhibit IV-11. Are Sufficient Technology Resources Available for Student Use



Media specialists identified the following improvements to areas in which technology resources are insufficient:

- More updated computers and printers
- More staff development and technology training
- More technical support at the schools
- Additional funding for technical support, training, and updated software and hardware

Principals stated the following improvements were needed to provide more adequate resources in the schools:

- Additional computers and software in the classrooms
- More technical support and training for teachers
- Updated computers and software
- Connection of portable classrooms

Teachers believed the following improvements were needed to provide more adequate resources in the schools:

- More computers in the classroom
- Better equipped computer labs
- More technology training and time for training
- More computers available to students to provide equal access

Open-Ended Responses

At the end of the survey, principals, teachers, and media specialists were provided an opportunity to add any additional comments concerning the information technology resources currently used at their school. Comments ranged from general perceptions of the school to

personal comments specific to the respondents' role in the school. The following section highlights some of the most frequently mentioned themes, along with sample comments based on the survey.

Respondents in all staff categories stated that updated computer software, hardware and other technology were needed in the schools:

- "We need computers and technological support in order to advance to the levels on this survey." (principal)
- "Our technology is becoming outdated and our district has not constructed a plan to begin the massive replacement of hardware, not to my knowledge." (principal)

Respondents in all categories believed that funding is inadequate to keep up with the changing technology and training needs:

- "We need more money for instruction and to investigate a better system for connection." (media specialist)

Several media specialists noted that schools need greater access to distance learning and interactive capabilities:

- "We have no way to expose our students to interactive learning through distance communications with other students; we need student e-mail and discussion board capabilities."

Several respondents in all categories noted inequity among schools and districts:

- "We are a poor district and have a long way to go. We need computers in the classrooms and technicians to keep it going. We need training. A help desk would be invaluable;" (media specialist)
- "I feel we are way behind where we should be and what we should have in comparison to surrounding schools. We definitely lack resources needed to be efficient and successful in the classroom and to prepare students for the real world." (teacher)

Respondents in all categories stated that technical support and maintenance needed improvement, primarily due to lack of funds.

- "With the rapid growth in our district, through the help with E-rate, maintenance of our equipment is a problem. With no local funds provided, the maintenance budget is small." (media specialist)
- "We need an educational technology specialist in our district, not just technicians." (teacher)

Several teachers stated that classrooms do not have enough computers for student use, making teaching and learning difficult:

- "It is difficult to teach when we do not have more than two computers in the classroom. Having over 20 students in a class means we can't use technology as much as we would like."

Several teachers noted that more training is needed to keep up with new technology and innovative strategies for integrating technology into the classroom:

- "I would like more training, especially how to troubleshoot. If my computer is not doing what I want it to, how can I correct the problem?"